Panasonic®

Distributor Products Catalog

1990-91

Electronic Components

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Panasonic Electronic Components Division
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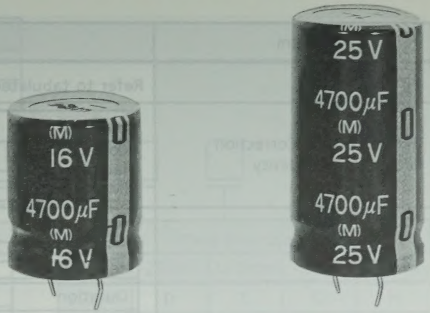
TS-U/TS-NH Series



FEATURES

- Life : 2000 hours at Specified Maximum operating temperature with ripple current applied
  - · TS-U Series ; +85°C
  - · TS-NH Series ; +105°C
- Wide Variations of Size from low Profile to Tall Profile
- Anti-solvent : Freon-TE. TES, TP-35 or Equivalents for Ratings of 16V to 100V DC

SPECIFICATIONS

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<tr><td rowspan="2">I ≦ 3 × √CV [μA]</td><td>>100 000</td><td>≦ 100V rating</td></tr>
<tr><td>-</td><td>≧ 160V rating</td></tr>
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<tr><td rowspan="2">tan δ (120Hz, +20°C) : ≦</td><td>TS-U Series</td><td>0.15</td><td>0.15</td><td>0.15</td><td>0.15</td><td>0.15</td><td>0.15</td></tr>
<tr><td>TS-NH Series</td><td>0.11</td><td>0.10</td><td>0.10</td><td>0.10</td><td>0.10</td><td>–</td></tr>
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<tr><td>Surge Voltage</td><td><table>
<tr><td>Rated working voltage [V]</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>80</td></tr>
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<tr><td>tan δ</td><td>≦ 150% of initial specified value</td></tr>
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<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 150% of Initial specified value</td></tr>
</table>
</td></tr>
<tr><td>Cleaning</td><td>
Capacitors for ratings of 16V to 100V DC shall be capable of withstanding exposure to following cleaning solvents.
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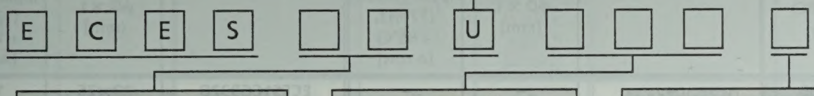
</table>
</td></tr>
</table>

PART NUMBER SYSTEM

Series Code	
U	TS-U Series
G	TS-NH Series



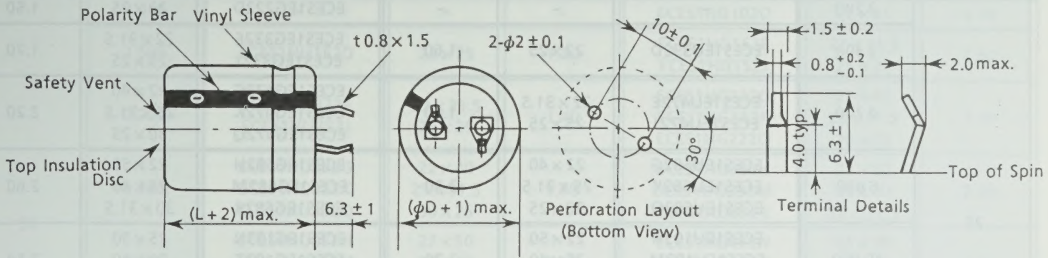
W.V. Code			
Code	W.V.	Code	W.V.
1C	16V	2A	100V
1E	25V	2C	160V
1V	35V	2D	200V
1H	50V	2E	250V
1J	63V	2G	400V
1K	80V	2W	450V

Capacitance Code in μF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Case Size Code				
ϕD \ L	25mm	31.5mm	40mm	50mm
22mm	D	E	G	H
25mm	J	K	M	N
30mm	Q	R	T	U
35mm	—	X	Y	(Z)

For case size code Z, "L" increases to 51mm.

DIMENSIONS [mm]



STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
16	3 300	–	–	–	ECES1CG332D	22×25	1.60
	4 700	ECES1CU472D	22×25	1.60	ECES1CG472E ECES1CG472J	22×31.5 25×25	2.00
	6 800	ECES1CU682E ECES1CU682J	22×31.5 25×25	1.80	ECES1CG682G ECES1CG682K ECES1CG682Q	22×40 25×31.5 30×25	2.40
	10 000	ECES1CU103G ECES1CU103K ECES1CU103Q	22×40 25×31.5 30×25	2.40	ECES1CG103H ECES1CG103M ECES1CG103R	22×50 25×40 30×31.5	2.90
	15 000	ECES1CU153H ECES1CU153M ECES1CU153R	22×50 25×40 30×31.5	3.20	ECES1CG153N ECES1CG153T ECES1CG153X	25×50 30×40 35×31.5	3.50
	22 000	ECES1CU223N ECES1CU223T ECES1CU223X	25×50 30×40 35×31.5	3.60	ECES1CG223U ECES1CG223Y	30×50 35×40	4.20
	33 000	ECES1CU333U ECES1CU333Y	30×50 35×40	4.40	ECES1CG333Z	35×51	4.80
	47 000	ECES1CU473Z	35×51	4.70	–	–	–
25	2 200	–	–	–	ECES1EG222D	22×25	1.50
	3 300	ECES1EU332D	22×25	1.60	ECES1EG332E ECES1EG332J	22×31.5 25×25	1.70
	4 700	ECES1EU472E ECES1EU472J	22×31.5 25×25	1.80	ECES1EG472G ECES1EG472K ECES1EG472Q	22×40 25×31.5 30×25	2.20
	6 800	ECES1EU682G ECES1EU682K ECES1EU682Q	22×40 25×31.5 30×25	2.30	ECES1EG682H ECES1EG682M ECES1EG682R	22×50 25×40 30×31.5	2.60
	10 000	ECES1EU103H ECES1EU103M ECES1EU103R	22×50 25×40 30×31.5	2.70	ECES1EG103N ECES1EG103T ECES1EG103X	25×50 30×40 35×31.5	3.10
	15 000	ECES1EU153N ECES1EU153T ECES1EU153X	25×50 30×40 35×31.5	3.40	ECES1EG153U ECES1EG153Y	30×50 35×40	3.50
	22 000	ECES1EU223U ECES1EU223Y	30×50 35×40	4.20	ECES1EG223Z	35×51	4.00
	33 000	ECES1EU333Z	35×51	4.60	–	–	–

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
35	1 500	–	–	–	ECES1VG152D	22×25	1.40
	2 200	ECES1VU222D	22×25	1.40	ECES1VG222E ECES1VG222J	22×31.5 25×25	1.60
	3 300	ECES1VU332E ECES1VU332J	22×31.5 25×25	1.70	ECES1VG332G ECES1VG332K ECES1VG332Q	22×40 25×31.5 30×25	1.80
	4 700	ECES1VU472G ECES1VU472K ECES1VU472Q	22×40 25×31.5 30×25	2.00	ECES1VG472H ECES1VG472M ECES1VG472R	22×50 25×40 30×31.5	2.30
	6 800	ECES1VU682H ECES1VU682M ECES1VU682R	22×50 25×40 30×31.5	2.40	ECES1VG682N ECES1VG682T ECES1VG682X	25×50 30×40 35×31.5	2.90
	10 000	ECES1VU103N ECES1VU103T ECES1VU103X	25×50 30×40 35×31.5	3.00	ECES1VG103U ECES1VG103Y	30×50 35×40	3.50
	15 000	ECES1VU153U ECES1VU153Y	30×50 35×40	3.70	ECES1VG153Z	35×51	3.90
	22 000	ECES1VU223Z	35×51	4.00	–	–	–
50	1 000	–	–	–	ECES1HG102D	22×25	1.30
	1 500	ECES1HU152D	22×25	1.20	ECES1HG152E ECES1HG152J	22×31.5 25×25	1.50
	2 200	ECES1HU222E ECES1HU222J	22×31.5 25×25	1.40	ECES1HG222G ECES1HG222K ECES1HG222Q	22×40 25×31.5 30×25	1.90
	3 300	ECES1HU332G ECES1HU332K ECES1HU332Q	22×40 25×31.5 30×25	1.70	ECES1HG332H ECES1HG332M ECES1HG332R	22×50 25×40 30×31.5	2.30
	4 700	ECES1HU472H ECES1HU472M ECES1HU472R	22×50 25×40 30×31.5	2.10	ECES1HG472N ECES1HG472T ECES1HG472X	25×50 30×40 35×31.5	2.80
	6 800	ECES1HU682N ECES1HU682T ECES1HU682X	25×50 30×40 35×31.5	2.60	ECES1HG682U ECES1HG682Y	30×50 35×40	3.20
	10 000	ECES1HU103U ECES1HU103Y	30×50 35×40	3.40	ECES1HG103Z	35×51	3.70
	15 000	ECES1HU153Z	35×51	3.70	–	–	–

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions φD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions φD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
63	680	–	–	–	ECES1JG681D	22×25	0.90
	1 000	ECES1JU102D	22×25	1.20	ECES1JG102E ECES1JG102J	22×31.5 25×25	1.30
	1 500	ECES1JU152E ECES1JU152J	22×31.5 25×25	1.30	ECES1JG152G ECES1JG152K ECES1JG152Q	22×40 25×31.5 30×25	1.60
	2 200	ECES1JU222G ECES1JU222K ECES1JU222Q	22×40 25×31.5 30×25	1.50	ECES1JG222H ECES1JG222M ECES1JG222R	22×50 25×40 30×31.5	2.00
	3 300	ECES1JU332H ECES1JU332M ECES1JU332R	22×50 25×40 30×31.5	1.90	ECES1JG332N ECES1JG332T ECES1JG332X	25×50 30×40 35×31.5	2.50
	4 700	ECES1JU472N ECES1JU472T ECES1JU472X	25×50 30×40 35×31.5	2.30	ECES1JG472U ECES1JG472Y	30×50 35×40	2.90
	6 800	ECES1JU682U ECES1JU682Y	30×50 35×40	3.00	ECES1JG682Z	35×51	3.30
	10 000	ECES1JU103Z	35×51	3.30	–	–	–
80	470	–	–	–	ECES1KG471D	22×25	0.80
	680	ECES1KU681D	22×25	1.00	ECES1KG681E ECES1KG681J	22×31.5 25×25	1.20
	1 000	ECES1KU102E ECES1KU102J	22×31.5 25×25	1.20	ECES1KG102G ECES1KG102K ECES1KG102Q	22×40 25×31.5 30×25	1.50
	1 500	ECES1KU152G ECES1KU152K ECES1KU152Q	22×40 25×31.5 30x25	1.40	ECES1KG152H ECES1KG152M ECES1KG152R	22×50 25×40 30×31.5	1.80
	2 200	ECES1KU222H ECES1KU222M ECES1KU222R	22x50 25x40 30x31.5	1.70	ECES1KG222N ECES1KG222T ECES1KG222X	25×50 30×40 35×31.5	2.30
	3 300	ECES1KU332N ECES1KU332T ECES1KU332X	25x50 30x40 35×31.5	2.10	ECES1KG332U ECES1KG332Y	30×50 35×40	2.80
	4 700	ECES1KU472U ECES1KU472Y	30x50 35x40	2.60	ECES1KG472Z	35×51	3.00
	6 800	ECES1KU682Z	35×51	3.10	–	–	–

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	**TS-U** Series			**TS-NH** Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
100	330	–	–	–	ECES2AG331D	22 × 25	0.70
	470	ECES2AU471D	22 × 25	1.00	ECES2AG471E ECES2AG471J	22 × 31.5 25 × 25	1.20
	680	ECES2AU681E ECES2AU681J	22 × 31.5 25 × 25	1.10	ECES2AG681G ECES2AG681K ECES2AG681Q	22 × 40 25 × 31.5 30 × 25	1.40
	1 000	ECES2AU102G ECES2AU102K ECES2AU102Q	22 × 40 25 × 31.5 30 × 25	1.20	ECES2AG102H ECES2AG102M ECES2AG102R	22 × 50 25 × 40 30 × 31.5	1.70
	1 500	ECES2AU152H ECES2AU152M ECES2AU152R	22 × 50 25 × 40 30 × 31.5	1.50	ECES2AG152N ECES2AG152T ECES2AG152X	25 × 50 30 × 40 35 × 31.5	2.10
	2 200	ECES2AU222N ECES2AU222T ECES2AU222X	25 × 50 30 × 40 35 × 31.5	1.80	ECES2AG222U ECES2AG222Y	30 × 50 35 × 40	2.60
	3 300	ECES2AU332U ECES2AU332Y	30 × 50 35 × 40	2.40	ECES2AG332Z	35 × 51	2.90
	4 700	ECES2AU472Z	35 × 51	2.70	–	–	–
160	150	–	–	–	ECES2CG151D	22 × 25	0.70
	180	ECES2CU181D	22 × 25	0.65	–	–	–
	220	–	–	–	ECES2CG221E ECES2CG221J	22 × 31.5 25 × 25	1.00
	270	ECES2CU271E ECES2CU271J	22 × 31.5 25 × 25	0.87	–	–	–
	330	–	–	–	ECES2CG331G ECES2CG331K ECES2CG331Q	22 × 40 25 × 31.5 30 × 25	1.20
	390	ECES2CU391G ECES2CU391K ECES2CU391Q	22 × 40 25 × 31.5 30 × 25	1.10	–	–	–
	470	–	–	–	ECES2CG471H ECES2CG471M ECES2CG471R	22 × 50 25 × 40 30 × 31.5	1.40
	560	ECES2CU561H ECES2CU561M ECES2CU561R	22 × 50 25 × 40 30 × 31.5	1.30	–	–	–
	680	–	–	–	ECES2CG681N ECES2CG681T ECES2CG681X	25 × 50 30 × 40 35 × 31.5	1.70

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
160	820	ECES2CU821N ECES2CU821T ECES2CU821X	25×50 30×40 35×31.5	1.50	ECES2CG821U ECES2CG821Y	30×50 35×40	2.00
	1 200	ECES2CU122U ECES2CU122Y	30×50 35×40	1.80	ECES2CG122Z	35×51	2.30
	1 500	ECES2CU152Z	35×51	2.0	–	–	–
200	100	–	–	–	ECES2DG101D	22×25	0.72
	150	ECES2DU151D	22×25	0.65	ECES2DG151E ECES2DG151J	22×31.5 25×25	0.80
	180	–	–	–	ECES2DG181G ECES2DG181K ECES2DG181Q	22×40 25×31.5 30×25	0.85
	220	ECES2DU221E ECES2DU221J	22×31.5 25×25	0.87	ECES2DG221G ECES2DG221K ECES2DG221Q	22×40 25×31.5 30×25	1.00
	270	–	–	–	ECES2DG271H ECES2DG271M ECES2DG271R	22×50 25×40 30×31.5	1.10
	330	ECES2DU331G ECES2DU331K ECES2DU331Q	22×40 25×31.5 30x25	1.10	ECES2DG331H ECES2DG331M ECES2DG331R	22×50 25×40 30×31.5	1.20
	390	–	–	–	ECES2DG391N ECES2DG391T ECES2DG391X	25×50 30×40 35×31.5	1.25
	470	ECES2DU471H ECES2DU471M ECES2DU471R	22×50 25×40 30×31.5	1.30	ECES2DG471N ECES2DG471T ECES2DG471X	25×50 30×40 35×31.5	1.40
	560	ECES2DU561N ECES2DU561T ECES2DU561X	25×50 30×40 35×31.5	1.40	ECES2DG561U ECES2DG561Y	30×50 35×40	1.50
	680	ECES2DU681N ECES2DU681T ECES2DU681X	25×50 30×40 35×31.5	1.50	ECES2DG681U ECES2DG681Y	30×50 35×40	1.70
	820	ECES2DU821U ECES2DU821Y	30×50 35×40	1.70	ECES2DG821Z	35×51	2.00
	1 000	ECES2DU102U ECES2DU102Y	30×50 35×40	1.80	–	–	–
	1 200	ECES2DU122Z	35×51	2.10	–	–	–

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
250	47	–	–	–	ECES2EG470D	22×25	0.45
	100	–	–	–	ECES2EG101E ECES2EG101J	22×31.5 25×25	0.72
	120	ECES2EU121D	22×25	0.45	–	–	–
	150	ECES2EU151E ECES2EU151J	22×31.5 25×25	0.65	ECES2EG151G ECES2EG151K ECES2EG151Q	22×40 25×31.5 30×25	0.80
	180	–	–	–	ECES2EG181K	25×31.5	0.85
	220	ECES2EU221G ECES2EU221K ECES2EU221Q	22×40 25×31.5 30×25	0.87	ECES2EG221H ECES2EG221M ECES2EG221R	22×50 25×40 30×31.5	1.05
	270	–	–	–	ECES2EG271N ECES2EG271R	25×50 30×31.5	1.10
	330	ECES2EU331H ECES2EU331M ECES2EU331R	22×50 25×40 30×31.5	1.10	ECES2EG331N ECES2EG331T ECES2EG331X	25×50 30×40 35×31.5	1.25
	390	ECES2EU391N ECES2EU391T ECES2EU391X	25×50 30×40 35×31.5	1.20	ECES2EG391X	35×31.5	1.30
	470	ECES2EU471N ECES2EU471T ECES2EU471X	25×50 30×40 35×31.5	1.30	ECES2EG471U ECES2EG471Y	30×50 35×40	1.45
	560	ECES2EU561U ECES2EU561Y	30×50 35×40	1.40	–	–	–
	680	ECES2EU681U ECES2EU681Y	30×50 35×40	1.50	ECES2EG681Z	35×51	1.80
	1 000	ECES2EU102Z	35×51	1.90	–	–	–
400	33	–	–	–	ECES2GG330D	22×25	0.33
	47	ECES2GU470D	22×25	0.25	ECES2GG470E ECES2GG470J	22×31.5 25×25	0.47
	68	ECES2GU680E ECES2GU680J	22×31.5 25×25	0.35	ECES2GG680G ECES2GG680K ECES2GG680Q	22×40 25×31.5 30×25	0.56
	100	ECES2GU101G ECES2GU101K ECES2GU101Q	22×40 25×31.5 30×25	0.47	ECES2GG101H ECES2GG101M ECES2GG101R	22×50 25×40 30×31.5	0.69

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

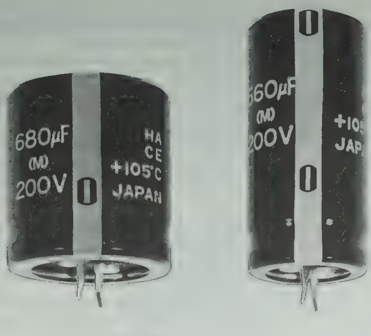
Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-U Series			TS-NH Series		
		Part Number	Dimensions φD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions φD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
400	150	ECES2GU151H ECES2GU151M ECES2GU151R	22×50 25×40 30×31.5	0.60	ECES2GG151N ECES2GG151T ECES2GG151X	25×50 30×40 35×31.5	0.82
	220	ECES2GU221N ECES2GU221T ECES2GU221X	25×50 30×40 35×31.5	0.75	ECES2GG221U ECES2GG221Y	30×50 35×40	1.00
	270	ECES2GU271U ECES2GU271Y	30×50 35×40	0.90	–	–	–
	330	–	–	–	ECES2GG331Z	35×51	1.20
	390	ECES2GU391Z	35×51	1.06	–	–	–
450	33	ECES2WU330D	22×25	0.20	–	–	–
	47	ECES2WU470E ECES2WU470J	22×31.5 25×25	0.29	–	–	–
	68	ECES2WU680G ECES2WU680K ECES2WU680Q	22×40 25×31.5 30×25	0.38	–	–	–
	100	ECES2WU101H ECES2WU101M ECES2WU101R	22×50 25×40 30×31.5	0.52	–	–	–
	150	ECES2WU151N ECES2WU151T ECES2WU151X	25×50 30×40 35×31.5	0.70	–	–	–
	220	ECES2WU221U ECES2WU221Y	30×50 35×40	0.92	–	–	–
	330	ECES2WU331Z	35×51	1.07	–	–	–

※ TS-U series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

TS-UP/TS-HA Series

FEATURES

- **Life : 2000 hours at specified maximum operating temperature with ripple current applied**
  - **TS-UP Series ; +85°C**
  - **TS-HA Series ; +105°C**
- **Reduced Size :**
  - **TS-UP Series ; up to 40% less volume than TS-U Series**
  - **TS-HA Series ; up to 50% less volume than TS-NH Series**
- **Wide Variations of Size from Low Profile to Tall Profile**



SPECIFICATIONS

Item	Performance Characteristics	
Rated Working Voltage	TS-UP Series	16V to 450V DC
	TS-HA Series	16V to 400V DC

Item	Series \ Rated W.V. [V]	≤ 250	≥ 400
Operating temperature Range	TS-UP Series	−40°C to +85°C	−25°C to +85°C
	TS-HA Series	−40°C to +105°C	−25°C to +105°C

Item	Performance Characteristics
Capacitance Tolerance	±20% (120Hz, +20°C)
Leakage Current	$I \leq 3 \times \sqrt{CV}$ [μA] measured after a 5 minute application of rated working voltage at +20°C (C = nominal capacitance in microfarads, V = rated working voltage in volts).

Item	Rated working voltage [V]		16	25	35	50	63	80
Tangent of Loss Angle	tan δ (120Hz, +20°C) : ≤	TS-UP Series	0.50	0.40	0.35	0.30	0.25	0.20
		TS-HA Series	0.45	0.35	0.30	0.25	0.20	0.17
	Rated working voltage [V]		100	160	200	250	400	450
	tan δ (120Hz, +20°C) : ≤	TS-UP Series	0.20	0.15	0.15	0.15	0.15	0.15
		TS-HA Series	0.15	0.15	0.15	0.15	0.15	–

Item		16	25	35	50	63	80
Surge Voltage	Rated working voltage [V]	16	25	35	50	63	80
	Rated surge voltage [V]	20	32	44	63	79	100
	Rated working voltage [V]	100	160	200	250	400	450
	Rated surge voltage [V]	125	200	250	300	450	500

Item	Performance Characteristics
Ripple Current	Refer to tabulated standard products table.

Item	Frequency [Hz]		50	60	120	500	1k	10k – 50k
Ripple Current Correction Factor for Frequency	Correction factor (Multiplier)	10-100V	0.93	0.95	1.00	1.05	1.08	1.15
		160-450V	0.75	0.80	1.00	1.20	1.25	1.40

SPECIFICATIONS (continued)

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PART NUMBER SYSTEM

Series Code	
P	TS-UP Series
A	TS-HA Series

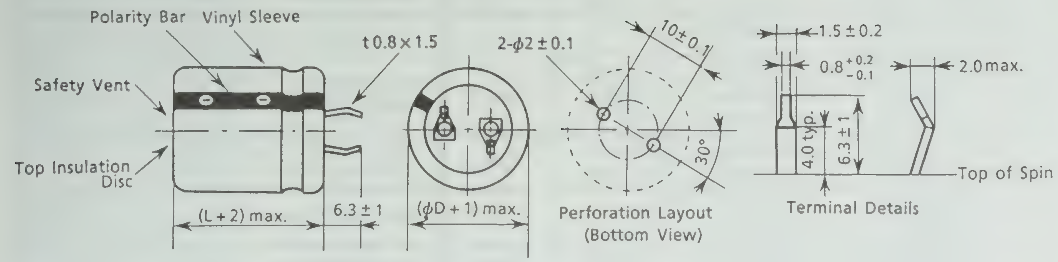
E C O S □ □ □ □ □ □ □ A

W.V. Code			
Code	W.V.	Code	W.V.
1C	16V	2A	100V
1E	25V	2C	160V
1V	35V	2D	200V
1H	50V	2E	250V
1J	63V	2G	400V
1K	80V	2W	450V

Capacitance Code in μF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Case Diameter Code	
Code	ϕ
B	22 mm
C	25 mm
D	30 mm
E	35 mm

DIMENSIONS [mm]



STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
16	6 800	–	–	–	ECOS1CA682B A	22 × 25	2.20
	8 200	–	–	–	ECOS1CA822B A	22 × 30	2.40
	10 000	ECOS1CP103B A ECOS1CP103C A	22 × 30 25 × 25	2.40	ECOS1CA103B A ECOS1CA103C A	22 × 30 25 × 25	2.60
	12 000	ECOS1CP123B A ECOS1CP123C A	22 × 30 25 × 25	2.70	ECOS1CA123B A ECOS1CA123C A ECOS1CA123D A	22 × 35 25 × 30 30 × 25	2.90
	15 000	ECOS1CP153B A ECOS1CP153C A	22 × 35 25 × 30	3.20	ECOS1CA153B A ECOS1CA153C A ECOS1CA153D A	22 × 40 25 × 35 30 × 30	3.20
	18 000	ECOS1CP183B A ECOS1CP183C A	22 × 40 25 × 30	3.40	ECOS1CA183B A ECOS1CA183C A ECOS1CA183D A ECOS1CA183E A	22 × 45 25 × 40 30 × 30 35 × 25	3.50
	22 000	ECOS1CP223B A ECOS1CP223C A ECOS1CP223D A	22 × 45 25 × 35 30 × 30	3.60	ECOS1CA223C A ECOS1CA223D A ECOS1CA223E A	25 × 45 30 × 35 35 × 30	3.80
	27 000	ECOS1CP273C A ECOS1CP273D A	25 × 45 30 × 35	4.10	ECOS1CA273C A ECOS1CA273D A ECOS1CA273E A	25 × 50 30 × 40 35 × 30	4.20
	33 000	ECOS1CP333C A ECOS1CP333D A ECOS1CP333E A	25 × 50 30 × 40 35 × 30	4.40	ECOS1CA333D A ECOS1CA333E A	30 × 45 35 × 35	4.70
	39 000	ECOS1CP393D A ECOS1CP393E A	30 × 45 35 × 35	4.60	ECOS1CA393D A ECOS1CA393E A	30 × 50 35 × 40	5.10
	47 000	ECOS1CP473D A ECOS1CP473E A	30 × 50 35 × 40	5.20	ECOS1CA473E A	35 × 45	5.50
	56 000	ECOS1CP563E A	35 × 45	5.40	ECOS1CA563E A	35 × 50	6.00
	68 000	ECOS1CP683E A	35 × 50	5.80	–	–	–
25	4 700	–	–	–	ECOS1EA472B A	22 × 25	2.00
	5 600	–	–	–	ECOS1EA562B A	22 × 30	2.20
	6 800	ECOS1EP682B A ECOS1EP682C A	22×30 25×25	2.30	ECOS1EA682B A ECOS1EA682C A	22 × 30 25 × 25	2.40
	8 200	ECOS1EP822B A ECOS1EP822C A	22×30 25×25	2.50	ECOS1EA822B A ECOS1EA822C A ECOS1EA822D A	22 × 35 25 × 30 30 × 25	2.70
	10 000	ECOS1EP103B A ECOS1EP103C A ECOS1EP103D A	22×35 25×30 30×25	2.70	ECOS1EA103B A ECOS1EA103C A ECOS1EA103D A	22 × 40 25 × 35 30 × 30	3.00

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
25	12 000	ECOS1EP123B A ECOS1EP123C A ECOS1EP123D A	22×40 25×35 30×30	3.00	ECOS1EA123B A ECOS1EA123C A ECOS1EA123D A ECOS1EA123E A	22 × 45 25 × 40 30 × 30 35 × 25	3.20
	15 000	ECOS1EP153B A ECOS1EP153C A ECOS1EP153D A	22×50 25×40 30×30	3.40	ECOS1EA153C A ECOS1EA153D A ECOS1EA153E A	25 × 45 30 × 35 35 × 30	3.60
	18 000	ECOS1EP183C A ECOS1EP183D A	25×45 30×35	3.80	ECOS1EA183C A ECOS1EA183D A ECOS1EA183E A	25 × 50 30 × 40 35 × 35	3.90
	22 000	ECOS1EP223C A ECOS1EP223D A	25×50 30×40	4.20	ECOS1EA223D A ECOS1EA223E A	30 × 45 35 × 35	4.30
	27 000	ECOS1EP273D A ECOS1EP273E A	30×45 35×35	4.60	ECOS1EA273E A	35 × 45	4.80
	33 000	ECOS1EP333D A ECOS1EP333E A	30×50 35×40	5.00	ECOS1EA333E A	35 × 50	5.50
	39 000	ECOS1EP393E A	35×45	5.30	–	–	–
	47 000	ECOS1EP473E A	35×50	5.60	–	–	–
35	3 300	–	–	–	ECOS1VA332B A	22 × 25	1.90
	3 900	–	–	–	ECOS1VA392B A	22 × 30	2.00
	4 700	ECOS1VP472B A ECOS1VP472C A	22×30 25×25	2.00	ECOS1VA472B A ECOS1VA472C A	22 × 35 25 × 25	2.20
	5 600	ECOS1VP562B A ECOS1VP562C A	22×30 25×25	2.30	ECOS1VA562B A ECOS1VA562C A ECOS1VA562D A	22 × 35 25 × 30 30 × 25	2.40
	6 800	ECOS1VP682B A ECOS1VP682C A	22×35 25×30	2.40	ECOS1VA682B A ECOS1VA682C A ECOS1VA682D A	22 × 40 25 × 35 30 × 30	2.60
	8 200	ECOS1VP822B A ECOS1VP822C A	22×40 25×35	2.70	ECOS1VA822B A ECOS1VA822C A ECOS1VA822D A ECOS1VA822E A	22 × 50 25 × 40 30 × 30 35 × 25	2.90
	10 000	ECOS1VP103B A ECOS1VP103C A ECOS1VP103D A ECOS1VP103E A	22×45 25×40 30×30 35×25	3.00	ECOS1VA103C A ECOS1VA103D A ECOS1VA103E A	25 × 45 30 × 35 35 × 30	3.20
	12 000	ECOS1VP123C A ECOS1VP123D A ECOS1VP123E A	25×45 30×35 35×30	3.30	ECOS1VA123C A ECOS1VA123D A ECOS1VA123E A	25 × 50 30 × 40 35 × 30	3.50

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
35	15 000	ECOS1VP153C A ECOS1VP153D A ECOS1VP153E A	25×50 30×40 35×30	3.70	ECOS1VA153D A ECOS1VA153E A	30 × 45 35 × 35	3.90
	18 000	ECOS1VP183D A ECOS1VP183E A	30×45 35×35	4.10	ECOS1VA183E A	35 × 40	4.30
	22 000	ECOS1VP223D A ECOS1VP223E A	30×50 35×40	4.40	ECOS1VA223E A	35 × 50	5.00
	27 000	ECOS1VP273E A	35×45	4.80	–	–	–
	33 000	ECOS1VP333E A	35×50	5.30	–	–	–
50	1 800	–	–	–	ECOS1HA182B A	22 × 25	1.50
	2 200	–	–	–	ECOS1HA222B A	22 × 30	1.70
	2 700	–	–	–	ECOS1HA272B A ECOS1HA272C A	22 × 30 25 × 25	1.80
	3 300	ECOS1HP332B A ECOS1HP332C A	22×30 25×25	1.70	ECOS1HA332B A ECOS1HA332C A	22 × 35 25 × 30	2.00
	3 900	ECOS1HP392B A ECOS1HP392C A	22×30 25×25	2.00	ECOS1HA392B A ECOS1HA392C A ECOS1HA392D A	22 × 40 25 × 35 30 × 25	2.20
	4 700	ECOS1HP472B A ECOS1HP472C A ECOS1HP472D A	22×35 25×30 30×25	2.10	ECOS1HA472B A ECOS1HA472C A ECOS1HA472D A ECOS1HA472E A	22 × 45 25 × 40 30 × 30 35 × 25	2.50
	5 600	ECOS1HP562B A ECOS1HP562C A ECOS1HP562D A	22×40 25×35 30×30	2.30	ECOS1HA562B A ECOS1HA562C A ECOS1HA562D A ECOS1HA562E A	22 × 50 25 × 40 30 × 35 35 × 30	2.80
	6 800	ECOS1HP682B A ECOS1HP682C A ECOS1HP682D A	22×50 25×40 30×30	2.60	ECOS1HA682C A ECOS1HA682D A ECOS1HA682E A	25 × 50 30 × 40 35 × 30	3.30
	8 200	ECOS1HP822C A ECOS1HP822D A	25×45 30×35	3.00	ECOS1HA822D A ECOS1HA822E A	30 × 45 35 × 35	3.60
	10 000	ECOS1HP103C A ECOS1HP103D A ECOS1HP103E A	25×50 30×40 35×30	3.40	ECOS1HA103D A ECOS1HA103E A	30 × 50 35 × 40	4.00
	12 000	ECOS1HP123D A ECOS1HP123E A	30×45 35×35	3.70	ECOS1HA123E A	35 × 45	4.50
	15 000	ECOS1HP153D A ECOS1HP153E A	30×50 35×40	4.00	ECOS1HA153E A	35 × 50	4.80
	18 000	ECOS1HP183E A	35×45	4.30	–	–	–
	22 000	ECOS1HP223E A	35×50	4.70	–	–	–

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
63	1 200	–	–	–	ECOS1JA122B A	22 × 25	1.40
	1 500	–	–	–	ECOS1JA152B A ECOS1JA152C A	22 × 30 25 × 25	1.50
	1 800	–	–	–	ECOS1JA182B A ECOS1JA182C A	22 × 30 25 × 25	1.70
	2 200	ECOS1JP222B A ECOS1JP222C A	22×30 25×25	1.50	ECOS1JA222B A ECOS1JA222C A	22 × 35 25 × 30	2.00
	2 700	ECOS1JP272B A ECOS1JP272C A	22×35 25×30	1.60	ECOS1JA272B A ECOS1JA272C A ECOS1JA272D A	22 × 40 25 × 35 30 × 25	2.20
	3 300	ECOS1JP332B A ECOS1JP332C A ECOS1JP332D A	22×40 25×30 30×25	1.90	ECOS1JA332B A ECOS1JA332C A ECOS1JA332D A ECOS1JA332E A	22 × 50 25 × 40 30 × 30 35 × 25	2.50
	3 900	ECOS1JP392B A ECOS1JP392C A ECOS1JP392D A	22×45 25×35 30×30	2.10	ECOS1JA392C A ECOS1JA392D A ECOS1JA392E A	25 × 45 30 × 35 35 × 30	2.70
	4 700	ECOS1JP472B A ECOS1JP472C A ECOS1JP472D A ECOS1JP472E A	22×50 25×40 30×30 35×25	2.30	ECOS1JA472C A ECOS1JA472D A ECOS1JA472E A	25 × 50 30 × 40 35 × 30	3.00
	5 600	ECOS1JP562C A ECOS1JP562D A ECOS1JP562E A	25×45 30×35 35×30	2.60	ECOS1JA562D A ECOS1JA562E A	30 × 45 35 × 35	3.30
	6 800	ECOS1JP682C A ECOS1JP682D A ECOS1JP682E A	25×50 30×40 35×30	3.00	ECOS1JA682D A ECOS1JA682E A	30 × 50 35 × 40	3.60
	8 200	ECOS1JP822D A ECOS1JP822E A	30×45 35×35	3.10	ECOS1JA822E A	35 × 45	3.90
	10 000	ECOS1JP103E A	35×40	3.40	ECOS1JA103E A	35 × 50	4.40
	12 000	ECOS1JP123E A	35×50	3.70	–	–	–
80	820	–	–	–	ECOS1KA821B A	22 × 25	1.20
	1 000	–	–	–	ECOS1KA102B A ECOS1KA102C A	22 × 30 25 × 25	1.30
	1 200	–	–	–	ECOS1KA122B A ECOS1KA122C A	22 × 30 25 × 25	1.50
	1 500	ECOS1KP152B A ECOS1KP152C A	22×30 25×25	1.40	ECOS1KA152B A ECOS1KA152C A	22 × 35 25 × 30	1.70

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
80	2 200	ECOS1KP222B A ECOS1KP222C A ECOS1KP222D A	22×40 25×30 30×25	1.70	ECOS1KA222B A ECOS1KA222C A ECOS1KA222D A ECOS1KA222E A	22 × 45 25 × 35 30 × 30 35 × 25	2.10
	2 700	ECOS1KP272B A ECOS1KP272C A ECOS1KP272D A	22×45 25×35 30×30	1.80	ECOS1KA272C A ECOS1KA272D A ECOS1KA272E A	25 × 45 30 × 35 35 × 30	2.40
	3 300	ECOS1KP332B A ECOS1KP332C A ECOS1KP332D A	22×50 25×40 30×30	2.10	ECOS1KA332C A ECOS1KA332D A ECOS1KA332E A	25 × 50 30 × 40 35 × 30	2.60
	3 900	ECOS1KP392C A ECOS1KP392D A	25×45 30×35	2.30	ECOS1KA392D A ECOS1KA392E A	30 × 45 35 × 35	3.00
	4 700	ECOS1KP472C A ECOS1KP472D A	25×50 30×40	2.60	ECOS1KA472D A ECOS1KA472E A	30 × 50 35 × 40	3.30
	5 600	ECOS1KP562D A ECOS1KP562E A	30×45 35×35	2.90	ECOS1KA562E A	35 × 45	3.70
	6 800	ECOS1KP682D A ECOS1KP682E A	30×50 35×40	3.30	ECOS1KA682E A	35 × 50	3.90
	8 200	ECOS1KP822E A	35×50	3.50	–	–	–
100	560	–	–	–	ECOS2AA561B A	22 × 25	1.10
	820	–	–	–	ECOS2AA821B A ECOS2AA821C A	22 × 30 25 × 25	1.40
	1 000	ECOS2AP102B A ECOS2AP102C A	22×30 25×25	1.20	ECOS2AA102B A ECOS2AA102C A	22 × 35 25 × 30	1.70
	1 200	ECOS2AP122B A ECOS2AP122C A	22×35 25×30	1.20	ECOS2AA122B A ECOS2AA122C A ECOS2AA122D A	22 × 40 25 × 35 30 × 25	1.80
	1 500	ECOS2AP152B A ECOS2AP152C A ECOS2AP152D A	22×40 25×30 30×25	1.50	ECOS2AA152B A ECOS2AA152C A ECOS2AA152D A ECOS2AA152E A	22 × 45 25 × 40 30 × 30 35 × 25	2.10
	1 800	ECOS2AP182B A ECOS2AP182C A ECOS2AP182D A	22×45 25×35 30×30	1.60	ECOS2AA182C A ECOS2AA182D A ECOS2AA182E A	25 × 45 30 × 35 35 × 30	2.30
	2 200	ECOS2AP222B A ECOS2AP222C A ECOS2AP222D A	22×50 25×40 30×30	1.80	ECOS2AA222C A ECOS2AA222D A ECOS2AA222E A	25 × 50 30 × 40 35 × 30	2.60
	2 700	ECOS2AP272C A ECOS2AP272D A	25×45 30×35	2.10	ECOS2AA272D A ECOS2AA272E A	30 × 45 35 × 35	2.90
	3 300	ECOS2AP332C A ECOS2AP332D A	25×50 30×40	2.40	ECOS2AA332D A ECOS2AA332E A	30 × 50 35 × 40	3.20

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
100	3 900	ECOS2AP392D A ECOS2AP392E A	30×45 35×35	2.50	ECOS2AA392E A	35 × 45	3.60
	4 700	ECOS2AP472D A ECOS2AP472E A	30×50 35×40	2.70	ECOS2AA472E A	35 × 50	3.80
	5 600	ECOS2AP562E A	35×45	2.90	–	–	–
	6 800	ECOS2AP682E A	35×50	3.30	–	–	–
160	270	–	–	–	ECOS2CA271B A	22 × 25	1.10
	330	ECOS2CP331B A	22×25	1.10	ECOS2CA331B A	22 × 30	1.20
	390	ECOS2CP391B A ECOS2CP391C A	22×30 25×25	1.20	ECOS2CA391B A ECOS2CA391C A	22 × 30 25 × 25	1.30
	470	ECOS2CP471B A ECOS2CP471C A	22×30 25×25	1.30	ECOS2CA471B A ECOS2CA471C A	22 × 35 25 × 30	1.40
	560	ECOS2CP561B A ECOS2CP561C A ECOS2CP561D A	22×35 25×30 30×25	1.42	ECOS2CA561B A ECOS2CA561C A ECOS2CA561D A	22 × 40 25 × 30 30 × 25	1.50
	680	ECOS2CP681B A ECOS2CP681C A ECOS2CP681D A	22×40 25×35 30×25	1.50	ECOS2CA681B A ECOS2CA681C A ECOS2CA681D A	22 × 45 25 × 35 30 × 30	1.70
	820	ECOS2CP821B A ECOS2CP821C A ECOS2CP821D A	22×45 25×35 30×30	1.65	ECOS2CA821C A ECOS2CA821D A	25 × 40 30 × 30	2.00
	1 000	ECOS2CP102C A ECOS2CP102D A ECOS2CP102E A	25×45 30×35 35×30	1.80	ECOS2CA102C A ECOS2CA102D A	25 × 45 30 × 35	2.20
	1 200	ECOS2CP122C A ECOS2CP122D A ECOS2CP122E A	25×50 30×35 35×30	1.98	ECOS2CA122C A ECOS2CA122D A	25 × 50 30 × 40	2.30
	1 500	ECOS2CP152D A ECOS2CP152E A	30×45 35×35	2.01	ECOS2CA152D A ECOS2CA152E A	30 × 45 35 × 35	2.50
	1 800	ECOS2CP182D A ECOS2CP182E A	30×50 35×40	2.12	ECOS2CA182D A ECOS2CA182E A	30 × 50 35 × 40	2.70
	2 200	ECOS2CP222E A	35 × 45	2.20	ECOS2CA222E A	35 × 50	2.90
	2 700	ECOS2CP272E A	35 × 50	2.50	–	–	–

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions φD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions φD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
200	220	–	–	–	ECOS2DA221B A	22 × 25	1.00
	270	ECOS2DP271B A	22×25	0.96	ECOS2DA271B A ECOS2DA271C A	22 × 30 25 × 25	1.10
	330	ECOS2DP331B A ECOS2DP331C A	22×30 25×25	1.10	ECOS2DA331B A ECOS2DA331C A	22 × 30 25 × 25	1.20
	390	ECOS2DP391B A ECOS2DP391C A	22×30 25×25	1.20	ECOS2DA391B A ECOS2DA391C A ECOS2DA391D A	22 × 35 25 × 30 30 × 25	1.30
	470	ECOS2DP471B A ECOS2DP471C A ECOS2DP471D A	22×35 25×30 30×25	1.30	ECOS2DA471B A ECOS2DA471C A ECOS2DA471D A	22 × 40 25 × 35 30 × 25	1.40
	560	ECOS2DP561B A ECOS2DP561C A ECOS2DP561D A	22×40 25×35 30×25	1.42	ECOS2DA561B A ECOS2DA561C A ECOS2DA561D A	22 × 45 25 × 35 30 × 30	1.50
	680	ECOS2DP681B A ECOS2DP681C A ECOS2DP681D A	22×45 25×35 30×30	1.50	ECOS2DA681C A ECOS2DA681D A	25 × 40 30 × 30	1.70
	820	ECOS2DP821C A ECOS2DP821D A ECOS2DP821E A	25×45 30×35 35×25	1.65	ECOS2DA821C A ECOS2DA821D A ECOS2DA821E A	25 × 50 30 × 35 35 × 30	2.00
	1 000	ECOS2DP102C A ECOS2DP102D A ECOS2DP102E A	25×50 30×40 35×30	1.80	ECOS2DA102D A ECOS2DA102E A	30 × 45 35 × 35	2.20
	1 200	ECOS2DP122D A ECOS2DP122E A	30×45 35×35	1.98	ECOS2DA122D A ECOS2DA122E A	30 × 50 35 × 40	2.30
	1 500	ECOS2DP152D A ECOS2DP152E A	30×50 35×40	2.01	ECOS2DA152E A	35 × 50	2.50
	1 800	ECOS2DP182E A	35×45	2.12	–	–	–
	2 200	ECOS2DP222E A	35×50	2.20	–	–	–
250	180	ECOS2EP181B A	22×25	0.71	ECOS2EA181B A ECOS2EA181C A	22 × 30 25 × 25	0.90
	220	ECOS2EP221B A ECOS2EP221C A	22×30 25×25	0.87	ECOS2EA221B A ECOS2EA221C A	22 × 30 25 × 25	1.00
	270	ECOS2EP271B A ECOS2EP271C A	22×30 25×25	0.96	ECOS2EA271B A ECOS2EA271C A ECOS2EA271D A	22 × 35 25 × 30 30 × 25	1.10
	330	ECOS2EP331B A ECOS2EP331C A ECOS2EP331D A	22×35 25×30 30×25	1.10	ECOS2EA331B A ECOS2EA331C A ECOS2EA331D A	22 × 40 25 × 35 30 × 25	1.20

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
250	390	ECOS2EP391B A ECOS2EP391C A ECOS2EP391D A	22×40 25×35 30×25	1.20	ECOS2EA391B A ECOS2EA391C A ECOS2EA391D A	22 × 45 25 × 35 30 × 30	1.30
	470	ECOS2EP471B A ECOS2EP471C A ECOS2EP471D A	22×45 25×40 30×30	1.30	ECOS2EA471C A ECOS2EA471D A ECOS2EA471E A	25 × 45 30 × 35 35 × 30	1.40
	560	ECOS2EP561C A ECOS2EP561D A ECOS2EP561E A	25×45 30×35 35×25	1.42	ECOS2EA561C A ECOS2EA561D A ECOS2EA561E A	25 × 50 30 × 35 35 × 30	1.50
	680	ECOS2EP681C A ECOS2EP681D A ECOS2EP681E A	25×50 30×40 35×30	1.50	ECOS2EA681D A ECOS2EA681E A	30 × 45 35 × 35	1.70
	820	ECOS2EP821D A ECOS2EP821E A	30×45 35×35	1.65	ECOS2EA821D A ECOS2EA821E A	30 × 50 35 × 40	2.00
	1 000	ECOS2EP102D A ECOS2EP102E A	30×50 35×40	1.80	ECOS2EA102E A	35 × 45	2.20
	1 200	ECOS2EP122E A	35×45	1.98	ECOS2EA122E A	35 × 50	2.30
	1 500	ECOS2EP152E A	35×50	2.01	–	–	–
400	56	–	–	–	ECOS2GA560B A	22 × 25	0.51
	68	ECOS2GP680B A	22×25	0.32	ECOS2GA680B A ECOS2GA680C A	22 × 30 25 × 25	0.56
	82	ECOS2GP820B A	22×25	0.38	ECOS2GA820B A ECOS2GA820C A	22 × 35 25 × 25	0.64
	100	ECOS2GP101B A ECOS2GP101C A	22×30 25×25	0.47	ECOS2GA101B A ECOS2GA101C A	22 × 35 25 × 30	0.69
	120	ECOS2GP121B A ECOS2GP121C A	22×35 25×30	0.50	ECOS2GA121B A ECOS2GA121C A ECOS2GA121D A	22 × 40 25 × 35 30 × 25	0.75
	150	ECOS2GP151B A ECOS2GP151C A ECOS2GP151D A	22×40 25×30 30×25	0.58	ECOS2GA151B A ECOS2GA151C A ECOS2GA151D A	22 × 50 25 × 40 30 × 30	0.82
	180	ECOS2GP181B A ECOS2GP181C A ECOS2GP181D A	22×45 25×35 30×30	0.66	ECOS2GA181C A ECOS2GA181D A ECOS2GA181E A	25 × 45 30 × 35 35 × 25	0.90

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	TS-UP Series			TS-HA Series		
		Part Number	Dimensions ϕD × L [mm]	※Maximum Permissible ripple current (120Hz, +85°C) [A rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +105°C) [A rms]
400	220	ECOS2GP221B A ECOS2GP221C A ECOS2GP221D A	22×50 25×40 30×30	0.75	ECOS2GA221C A ECOS2GA221D A ECOS2GA221E A	25 × 50 30 × 40 35 × 30	1.00
	270	ECOS2GP271C A ECOS2GP271D A ECOS2GP271E A	25×45 30×35 35×30	0.83	ECOS2GA271D A ECOS2GA271E A	30 × 45 35 × 35	1.10
	330	ECOS2GP331D A ECOS2GP331E A	30×40 35×35	0.92	ECOS2GA331D A ECOS2GA331E A	30 × 50 35 × 40	1.20
	390	ECOS2GP391D A ECOS2GP391E A	30×45 35×40	0.98	ECOS2GA391E A	35 × 45	1.30
	470	ECOS2GP471E A	35×45	1.05	ECOS2GA471E A	35 × 50	1.40
	560	ECOS2GP561E A	35×50	1.13	–	–	–
450	56	ECOS2WP560B A	22×25	0.32	–	–	–
	68	ECOS2WP680B A	22×30	0.38	–	–	–
	82	ECOS2WP820B A ECOS2WP820C A	22×30 25×25	0.42	–	–	–
	100	ECOS2WP101B A ECOS2WP101C A ECOS2WP101D A	22×35 25×30 30×25	0.52	–	–	–
	120	ECOS2WP121B A ECOS2WP121C A ECOS2WP121D A	22×40 25×30 30×25	0.57	–	–	–
	150	ECOS2WP151B A ECOS2WP151C A ECOS2WP151D A	22×50 25×40 30×30	0.70	–	–	–
	180	ECOS2WP181C A ECOS2WP181D A ECOS2WP181E A	25×45 30×35 35×25	0.77	–	–	–
	220	ECOS2WP221C A ECOS2WP221D A ECOS2WP221E A	25×50 30×40 35×30	0.92	–	–	–
	270	ECOS2WP271D A ECOS2WP271E A	30×45 35×35	1.02	–	–	–
	330	ECOS2WP331D A ECOS2WP331E A	30×50 35×40	1.15	–	–	–
	390	ECOS2WP391E A	35×45	1.20	–	–	–
	470	ECOS2WP471E A	35×50	1.25	–	–	–

※ TS-UP series withstands the same ripple currents specified in TSW/TSS series for 1000 hours load life at 85°C.

TS-W/TS-S Series

TS-W/TS-S series are not recommended for new design. Select TS-U/TS-NH or TS-UP/TS-HA series as alternatives.

SPECIFICATIONS

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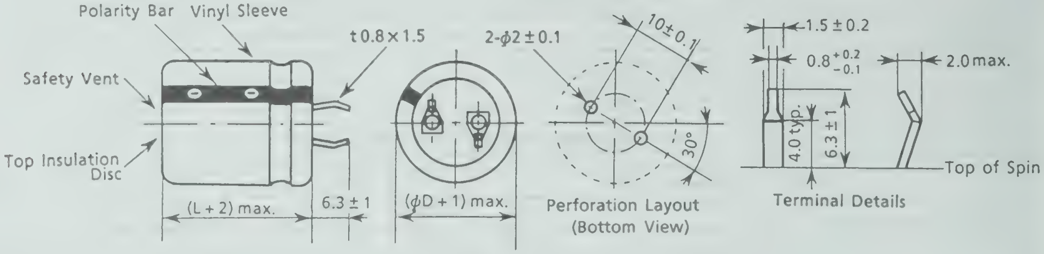
<tr><td>Surge voltage [V]</td><td>20</td><td>32</td><td>44</td><td>63</td><td>79</td></tr>
</table>
<table>
<tr><td>Rated working voltage [V]</td><td>80</td><td>100</td><td>160</td><td>200</td><td>250</td></tr>
<tr><td>Surge voltage [V]</td><td>100</td><td>125</td><td>200</td><td>250</td><td>300</td></tr>
</table></td></tr>
<tr><td>Ripple Current</td><td>Refer to tabulated maximum permissible ripple current or standard products table.</td></tr>
<tr><td>Ripple Current Correction Factor for Frequency</td><td>
<table>
<tr><td colspan="2">Frequency [Hz]</td><td>50</td><td>60</td><td>120</td><td>500</td><td>1k</td><td>10k – 50k</td></tr>
<tr><td rowspan="2">Correction factor (Multiplier)</td><td>16-100V</td><td>0.93</td><td>0.95</td><td>1.00</td><td>1.05</td><td>1.08</td><td>1.15</td></tr>
<tr><td>160-250V</td><td>0.75</td><td>0.80</td><td>1.00</td><td>1.20</td><td>1.25</td><td>1.40</td></tr>
</table></td></tr>
<tr><td>High Temperature Loading</td><td>Test conditions
<table>
<tr><td>Duration</td><td>1 000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>DC voltage with maximum permissible ripple current specified at +85°C (Sum of DC voltage and superimposed peak AC voltage for maximum permissible ripple current should be equal to rated DC working voltage).</td></tr>
</table></td></tr>
</table>

TS-W/TS-S series are not recommended for new design.
Select TS-U/TS-NH or TS-UP/TS-HA series as alternatives.

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th colspan="2">Performance Characteristics</th></tr>
<tr><td rowspan="4">High Temperature Loading (continued)</td><td colspan="2">Post test requirements at +20°C</td></tr>
<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 150% of initial specified value</td></tr>
<tr><td rowspan="15">Shelf Life</td><td colspan="2">Test conditions</td></tr>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td></tr>
<tr><td colspan="2">Post test conditioning by application of voltage</td></tr>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Ambient temperature</td><td>+20°C</td></tr>
<tr><td>Discharge after application of voltage</td><td>Discharge through a resistor</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
<tr><td colspan="2">Post test requirements at +20°C (after Post test conditioning)</td></tr>
<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>< 150% of Initial specified value</td></tr>
</table>

DIMENSIONS [mm]



TS-W/TS-S Series

TS-W/TS-S series are not recommended for new design.
Select TS-U/TS-NH or TS-UP/TS-HA series as alternatives.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Maximum Permissible ripple current (120Hz, +85°C) [A rms]	TS-W Series		TS-S Series	
			Part Number	Dimensions ϕD × L [mm]	Part Number	Dimensions ϕD × L [mm]
16	3 300	1.80	ECET16R332SW	22×25	–	–
	4 700	2.45	ECET16R472SW	22×31.5	ECES1CV472S	25×25
	6 800	3.10	ECET16R682SW	22×40	ECES1CV682S	30×25
	10 000	3.85	ECET16R103SW	25×40	ECES1CV103S	30×31.5
	15 000	4.60	ECET16R153SW	30.5×50	ECES1CV153S	35×31.5
25	2 200	1.70	ECET25R222SW	22×25	–	–
	3 300	2.40	ECET25R332SW	22×31.5	ECES1EV332S	25×25
	4 700	2.90	ECET25R472SW	22×40	ECES1EV472S	30×25
	6 800	3.55	ECET25R682SW	25×40	ECES1EV682S	30×31.5
	10 000	4.20	ECET25R103SW	25×50	ECES1EV103S	35×31.5
	15 000	4.90	ECET25R153SW	30.5×50	–	–
35	1 000	1.35	ECET35R102SW	22×25	–	–
	2 200	2.45	ECET35R222SW	22×31.5	ECES1VV222S	25×25
	3 300	3.05	ECET35R332SW	22×40	ECES1VV332S	30×25
	4 700	3.60	ECET35R472SW	25×40	ECES1VV472S	30×31.5
	6 800	4.10	ECET35R682SW	25×50	ECES1VV682S	35×31.5
	10 000	4.70	ECET35R103SW	30.5×50	–	–
50	1 000	1.40	ECET50R102SW	22×25	–	–
	2 200	2.60	ECET50R222SW	22×40	ECES1HV222S	30×25
	3 300	3.20	ECET50R332SW	25×40	ECES1HV332S	30×31.5
	4 700	3.75	ECET50R472SW	25×50	ECES1HV472S	35×31.5
	6 800	4.30	ECET50R682SW	30.5×50	–	–
63	470	1.10	ECET63R472SW	22×25	–	–
	1 000	1.95	ECET63R102SW	22×31.5	ECES1JV102S	25×25
	2 200	2.90	ECET63R222SW	22×40	ECES1JV222S	30×31.5
	3 300	3.40	ECET63R332SW	25×50	ECES1JV332S	35×31.5
	4 700	3.80	ECET63R472SW	30.5×50	–	–
80	470	1.10	ECET80R471SW	22×31.5	–	–
	680	1.25	–	–	ECES1KV681S	25×25
	1 000	2.00	ECET80R102SW	22×40	ECES1KV102S	30×25
	2 200	3.05	ECET80R222SW	25×50	ECES1KV222S	35×31.5
	3 300	3.55	ECET80R332SW	30.5×50	–	–
100	470	1.15	ECET2AR471SW	22×31.5	ECES2AV471S	25×25
	680	1.30	–	–	ECES2AV681S	30×25
	1 000	2.00	ECET2AR102SW	25×40	ECES2AV102S	30×31.5
	2 200	2.90	ECET2AR222SW	30.5×50	–	–

TS-W/TS-S Series

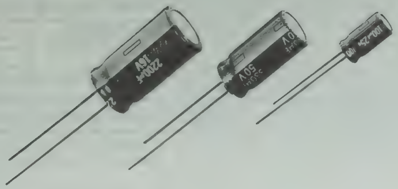
TS-W/TS-S series are not recommended for new design.
Select TS-U/TS-NH or TS-UP/TS-HA series as alternatives.

STANDARD PRODUCTS TABLE

Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Maximum Permissible ripple current (120Hz, +85°C) [A rms]	**TS-W** Series		**TS-S** Series	
			Part Number	Dimensions ϕD × L [mm]	Part Number	Dimensions ϕD × L [mm]
160	220	1.00	–	–	ECES2CV221S	25×25
	330	1.30	ECET2CR331SW	22×40	ECES2CV331S	30×25
	470	1.60	ECET2CR471SW	25×50	ECES2CV471S	30×31.5
	680	1.80	ECET2CR681SW	30.5×50	ECES2CV681S	35×31.5
	820	2.00	ECET2CR821SW	30.5×50	–	–
180	220	1.10	ECET2PR221SW	25×40	ECES2PV221SS	30×25
	330	1.50	ECET2PR331SW	25×40	ECES2PV331S	30×31.5
	470	1.80	ECET2PR471SW	25×50	ECES2PV471S	35×31.5
	680	2.10	ECET2PR681SW	30.5×50	–	–
200	220	1.30	ECET2DR221SW	25×40	ECES2DV221S	30×25
	330	1.60	ECET2DR331SW	25×50	ECES2DV331S	30×31.5
	470	1.90	ECET2DR471SW	30.5×50	ECES2DV471S	35×31.5
	560	2.10	ECET2DR561SW	30.5×50	–	–
	680	2.30	ECET2DR681SW	30.5×50	–	–
250	150	1.00	–	–	ECES2EV151S	30×25
	220	1.30	ECET2ER221SW	25×40	ECES2EV221S	30×31.5
	330	1.60	ECET2ER331SW	25×50	ECES2EV331S	35×31.5
	470	1.90	ECET2ER471SW	30.5×50		

SU Series
Radial Leads Type

FEATURES



- **Standard Grade**
- **Life : 2000 hours at +85°C**
- **Wide Range of Rated Working Voltage from 6.3V to 450V**
- **Fan Fold Box Packaging for Automatic Insertion**
- **Anti-solvent : Freon-TE, TES, TP35 or equivalents for 6.3V to 250V Rating**

SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="2">Performance Characteristics</th></tr>
<tr><td>Rated Working Voltage Range</td><td>6.3V to 100V Rating</td><td>160V to 450V Rating</td></tr>
<tr><td>Operating Temperature Range</td><td>−40°C to +85°C</td><td>−25°C to +85°C</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="2">±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td colspan="2">Leakage current shall be measured after a period of time specified below with an application of rated working voltage at +20°C.
<table>
<tr><th>Rated W.V. \ measurement</th><th>after 1 min</th><th>after 2 min</th></tr>
<tr><td>6.3V to 100V DC</td><td>I ≦ 0.03C·V or 4 [μA]
whichever is greater</td><td>I ≦ 0.01C·V or 3 [μA]
whichever is greater</td></tr>
<tr><td>160V to 450V DC</td><td>–</td><td>I ≦ 0,06C·V + 10 [μA]</td></tr>
</table>
(C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td colspan="2">
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≦</td><td>0.22</td><td>0.19</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.10</td><td>0.09</td></tr>
</table>
<table>
<tr><td>Rated working voltage [V]</td><td>100</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≦</td><td>0.08</td><td>0.16</td><td>0.18</td><td>0.18</td><td>0.20</td><td>0.20</td><td>0.20</td></tr>
</table>
For capacitance > 1000μF, add 0.02 per another 1000μF</td></tr>
<tr><td>Surge Voltage</td><td colspan="2">
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr>
<tr><td>Surge voltage [V]</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td><td>79</td></tr>
</table>
<table>
<tr><td>Rated working voltage [V]</td><td>100</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>Surge voltage [V]</td><td>125</td><td>200</td><td>250</td><td>300</td><td>400</td><td>450</td><td>500</td></tr>
</table></td></tr>
<tr><td>Ripple Current</td><td colspan="2">Refer to standard products table</td></tr>
<tr><td>Ripple Current Correction Factor for Frequency</td><td colspan="2">
<table>
<tr><td>Frequency [Hz]</td><td>50 / 60</td><td>120</td><td>1k</td><td>10k</td></tr>
<tr><td>Correction factor (Multiplier)</td><td>0.7</td><td>1</td><td>1.3</td><td>1.7</td></tr>
</table></td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Low Temperature Characteristics</td><td>
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr>
<tr><td rowspan="2">Impedance ratio (120Hz) :≦</td><td>−25°C/+20°C</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>−40°C/+20°C</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td></tr>
</table>
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>100</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td rowspan="2">Impedance ratio (120Hz) ≦</td><td>−25°C/+20°C</td><td>2</td><td>2</td><td>2</td><td>3</td><td>5</td><td>15</td><td>15</td></tr>
<tr><td>−40°C/+20°C</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
For capacitance > 1000μF : Add 0.5 per another 1000μF for −25°C / +20°C.
Add 1.0 per another 1000μF for −40°C / +20°C.
</td></tr>
<tr><td>High Temperature Loading</td><td>
Test conditions
<table>
<tr><td>Duration</td><td>2000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>Rated DC working voltage</td></tr>
</table>
Post test requirements (+20°C)
<table>
<tr><td>Leakage current</td><td>≦Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦150% of initial specified value</td></tr>
</table>
</td></tr>
<tr><td>Shelf Life</td><td>
Test conditions
<table>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td></tr>
</table>
Post test conditioning by application of voltage
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Ambient temperature</td><td>+20°C</td></tr>
<tr><td>Discharge after application of voltage</td><td>Discharge through a resistor</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements (+20°C) : Same limits for high temperature loading
<table>
<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 150% of initial specified value</td></tr>
</table>
</td></tr>
<tr><td>Cleaning</td><td>
Capacitors rated working voltage range of 6.3V to 250V, shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><td colspan="2">Conditions</td><td>Solvent structure</td><td>Exposure time</td><td>Temperature</td><td>Ultrasonic wave</td></tr>
<tr><td>Solvents</td><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≦ 5 min (total)</td><td>≦ boiling point at 1 atm</td><td>Acceptable</td></tr>
</table>
</td></tr>
</table>

PART NUMBER SYSTEM

E C E A ☐ ☐ U ☐ ☐ ☐ ☐

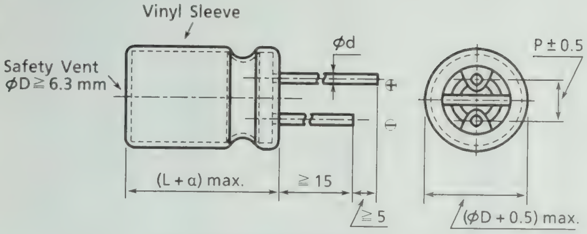
W.V. Code	
Code	W.V.
0J	6.3V
1A	10V
1C	16V
1E	25V
1V	35V
1H	50V
1J	63V
2A	100V
2C	100V
2D	200V
2E	250V
2V	350V
2G	400V
2W	450V

Capacitance Code in μF	
First two digits	Significant figures
Third digits	Number of zeros following
An "R" in first two blocks	Decimal point. In this case all figures are significant

<table>
<tr><th colspan="3">Suffix for Configuration</th></tr>
<tr><th>Suffix</th><th>Configuration</th><th>Packaging</th></tr>
<tr><td>(none)</td><td>Long lead</td><td>Bulk</td></tr>
<tr><td>※E</td><td>Snap-in lead<table><tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr><tr><td>5mm</td><td>φD : 5 to 12.5</td></tr><tr><td>7.5mm</td><td>φD : 16 to 18</td></tr></table></td><td>Bulk</td></tr>
<tr><td>※B</td><td>Taping<table><tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr><tr><td>5mm</td><td>φD : 5 to 12.5</td></tr><tr><td>7.5mm</td><td>φD : 16 to 18
(L : ≦ 25)</td></tr></table></td><td>Fan fold box<table><tr><th>φD</th><th>Pcs/box</th></tr><tr><td>5 - 6.3</td><td>2 000</td></tr><tr><td>8</td><td>1 000</td></tr><tr><td>10 - 12.5</td><td>500</td></tr><tr><td>16 - 18</td><td>250</td></tr></table></td></tr>
<tr><td>※I</td><td>Taping<table><tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr><tr><td>2.5mm</td><td>φD : 5 to 6.3</td></tr></table></td><td>Fan fold box<table><tr><th>φD</th><th>Pcs/box</th></tr><tr><td>5 - 6.3</td><td>2 000</td></tr></table></td></tr>
</table>

※ Not standard.

DIMENSIONS



φD	5	6.3	8	10	12.6	16	18
φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8
P	2	2.5	3.5	5	5	7.5	7.5

α	L
1.0 mm	≦ 16 mm
2.0 mm	≧ 20mm

STANDARD PRODUCTS TABLE

W.V. (S.V.)	Cap. 〔μF〕	Part No.	Cap. tol. 〔%〕 (120Hz/+20°C)	D.C.L. 〔μA〕 (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current 〔mA〕 rms (120Hz/+85°C) max	Dim. 〔mm〕	
							ϕD	L
6.3 (8)	100	ECEA0JU101	±20	6.3	0.22	130	5	11
	220	ECEA0JU221		13.8	0.22	240	6.3	11.2
	330	ECEA0JU331		20.7	0.22	300	6.3	11.2
	470	ECEA0JU471		29.6	0.22	380	8	11.5
	1,000	ECEA0JU102		63.0	0.22	580	10	12.5
	2,200	ECEA0JU222		138.6	0.24	890	12.5	20
	3,300	ECEA0JU332		207.9	0.26	1020	12.5	20
	4,700	ECEA0JU472		296.1	0.28	1170	16	25
	6,800	ECEA0JU682		428.4	0.32	1270	16	25
	10,000	ECEA0JU103		630.0	0.40	1450	16	31.5
	15,000	ECEA0JU153		945.0	0.50	1700	18	35.5
10 (13)	33	ECEA1AU330	±20	3.3	0.19	60	5	11
	47	ECEA1AU470		4.7	0.19	90	5	11
	100	ECEA1AU101		10.0	0.19	150	5	11
	220	ECEA1AU221		22.0	0.19	250	6.3	11.2
	330	ECEA1AU331		33.0	0.19	330	8	11.5
	470	ECEA1AU471		47.0	0.19	400	8	12.5
	1,000	ECEA1AU102		100.0	0.19	630	10	16
	2,200	ECEA1AU222		220.0	0.21	920	12.5	20
	3,300	ECEA1AU332		330.0	0.23	1090	12.5	25
	4,700	ECEA1AU472		470.0	0.25	1200	16	25
	6,800	ECEA1AU682		680.0	0.29	1400	16	31.5
	10,000	ECEA1AU103		1000.0	0.37	1600	18	35.5
16 (20)	22	ECEA1CU220	±20	3.5	0.16	75	5	11
	33	ECEA1CU330		5.2	0.16	110	5	11
	47	ECEA1CU470		7.5	0.16	130	5	11
	100	ECEA1CU101		16.0	0.16	180	6.3	11.2
	220	ECEA1CU221		35.2	0.16	280	8	11.5
	330	ECEA1CU331		52.8	0.16	350	8	12.5
	470	ECEA1CU471		75.2	0.16	440	10	12.5
	1,000	ECEA1CU102		160.0	0.16	680	10	20
	2,200	ECEA1CU222		352.0	0.18	1000	12.5	25
	3,300	ECEA1CU332		528.0	0.20	1200	16	25
	4,700	ECEA1CU472		752.0	0.22	1360	16	31.5
	6,800	ECEA1CU682		1088.0	0.26	1600	18	35.5
25 (32)	22	ECEA1EU220	±20	5.5	0.14	90	5	11
	33	ECEA1EU330		8.2	0.14	110	5	11
	47	ECEA1EU470		11.7	0.14	130	5	11
	100	ECEA1EU101		25.0	0.14	180	6.3	11.2
	220	ECEA1EU221		55.0	0.14	310	8	12.5
	330	ECEA1EU331		82.5	0.14	390	10	12.5
	470	ECEA1EU471		117.5	0.14	480	10	16
	1,000	ECEA1EU102		250.0	0.14	850	12.5	20
	2,200	ECEA1EU222		550.0	0.16	1200	16	25
	3,300	ECEA1EU332		825.0	0.18	1300	16	31.5
	4,700	ECEA1EU472		1175.0	0.20	1500	18	35.5
35 (44)	4.7	ECEA1VU4R7	±20	3.0	0.12	35	5	11
	10	ECEA1VU100		3.5	0.12	60	5	11
	22	ECEA1VU220		7.7	0.12	95	5	11
	33	ECEA1VU330		11.5	0.12	110	5	11
	47	ECEA1VU470		16.4	0.12	130	6.3	11.2
	100	ECEA1VU101		35.0	0.12	210	8	11.5
	220	ECEA1VU221		77.0	0.12	350	10	12.5
	330	ECEA1VU331		115.5	0.12	440	10	16
	470	ECEA1VU471		164.5	0.12	550	10	20
	1,000	ECEA1VU102		350.0	0.12	900	12.5	25
	2,200	ECEA1VU222		770.0	0.14	1250	16	31.5
	3,300	ECEA1VU332		1155.0	0.16	1400	18	35.5

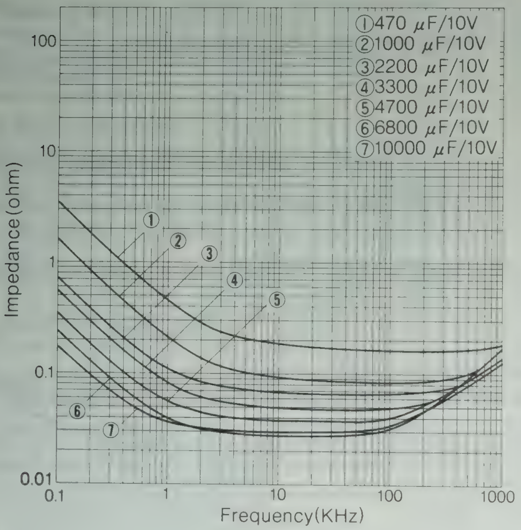
STANDARD PRODUCTS TABLE

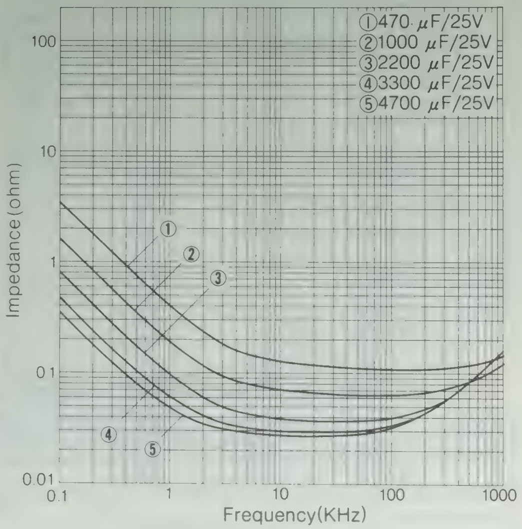
W.V. (S.V.)	Cap. 〔µF〕	Part No.	Cap. tol. 〔%〕 (120Hz/+20°C)	D.C.L. 〔µA〕 (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current 〔mA〕 rms (120Hz/+85°C) max.	Dim. 〔mm〕	
							ϕD	L
50 (63)	0.47	ECEA1HUR47	±20	3.0	0.10	5	5	11
	1	ECEA1HU010		3.0	0.10	10	5	11
	2.2	ECEA1HU2R2		3.0	0.10	20	5	11
	3.3	ECEA1HU3R3		3.0	0.10	35	5	11
	4.7	ECEA1HU4R7		3.0	0.10	45	5	11
	10	ECEA1HU100		5.0	0.10	65	5	11
	22	ECEA1HU220		11.0	0.10	100	5	11
	33	ECEA1HU330		16.5	0.10	110	6.3	11.2
	47	ECEA1HU470		23.5	0.10	130	6.3	11.2
	100	ECEA1HU101		50.0	0.10	250	8	12.5
	220	ECEA1HU221		110.0	0.10	400	10	16
	330	ECEA1HU331		165.0	0.10	500	10	20
	470	ECEA1HU471		235.0	0.10	650	12.5	20
	1,000	ECEA1HU102		500.0	0.10	1,050	16	25
	2,200	ECEA1HU222		1100.0	0.12	1,300	18	35.5
63 (79)	0.47	ECEA1JUR47	±20	3.0	0.09	5	5	11
	1	ECEA1JU010		3.0	0.09	10	5	11
	2.2	ECEA1JU2R2		3.0	0.09	29	5	11
	3.3	ECEA1JU3R3		3.0	0.09	40	5	11
	4.7	ECEA1JU4R7		3.0	0.09	45	5	11
	10	ECEA1JU100		6.3	0.09	70	5	11
	22	ECEA1JU220		13.8	0.09	105	6.3	11.2
	33	ECEA1JU330		20.7	0.09	130	6.3	11.2
	47	ECEA1JU470		29.6	0.09	160	8	11.5
	100	ECEA1JU101		63.0	0.09	270	10	12.5
	220	ECEA1JU221		138.6	0.09	450	10	20
	330	ECEA1JU331		207.9	0.09	550	12.5	20
	470	ECEA1JU471		296.1	0.09	750	12.5	25
	1,000	ECEA1JU102		630.0	0.09	1,100	16	31.5
100 (125)	0.47	ECEA2AUR47	±20	3.0	0.08	10	5	11
	1	ECEA2AU010		3.0	0.08	20	5	11
	2.2	ECEA2AU2R2		3.0	0.08	30	5	11
	3.3	ECEA2AU3R3		3.3	0.08	40	5	11
	4.7	ECEA2AU4R7		4.7	0.08	50	5	11
	10	ECEA2AU100		10.0	0.08	70	6.3	11.2
	22	ECEA2AU220		22.0	0.08	115	8	11.5
	33	ECEA2AU330		33.0	0.08	145	10	12.5
	47	ECEA2AU470		47.0	0.08	180	10	16
	100	ECEA2AU101		100.0	0.08	350	12.5	20
	220	ECEA2AU221		220.0	0.08	550	16	25
	330	ECEA2AU331		330.0	0.08	700	16	25
	470	ECEA2AU471		470.0	0.08	900	16	31.5
160 (200)	0.47	ECEA2CUR47	±20	14.5	0.16	9.5	5	11
	1	ECEA2CU010		19.6	0.16	13	6.3	11.2
	2.2	ECEA2CU2R2		31.1	0.16	22	6.3	11.2
	3.3	ECEA2CU3R3W		41.6	0.16	31	6.3	11.2
	4.7	ECEA2CU4R7		55.1	0.16	40	8	11.5
	10	ECEA2CU100		106.0	0.16	66	10	12.5
	22	ECEA2CU220W		221.2	0.16	110	10	16
	33	ECEA2CU330W		326.8	0.16	144	10	20
	47	ECEA2CU470W		461.2	0.16	180	12.5	20
	100	ECEA2CU101		970.0	0.16	300	16	25
	220	ECEA2CU221W		2122.0	0.16	510	18	31.5

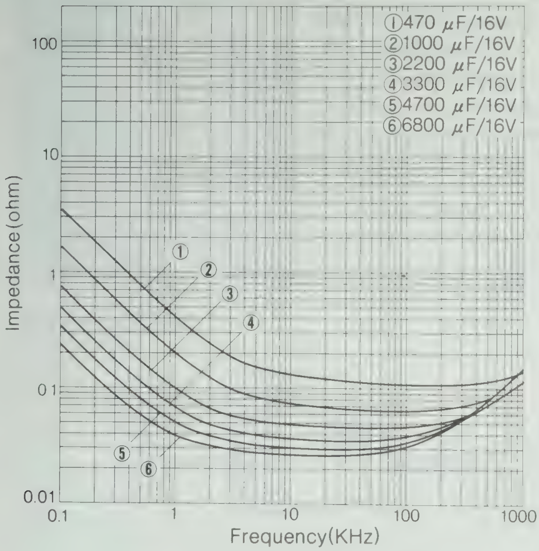
STANDARD PRODUCTS TABLE

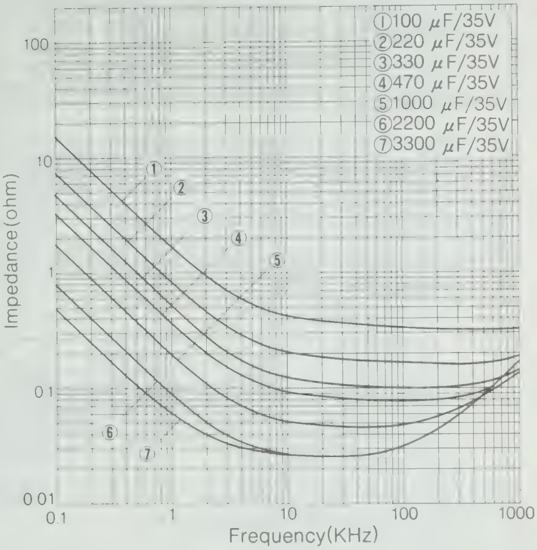
W.V. (S.V.)	Cap. 〔μF〕	Part No.	Cap. tol. 〔%〕 (120Hz/+20°C)	D.C.L. 〔μA〕 (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current 〔mA〕 rms (120Hz/+85°C) max.	Dim. 〔mm〕	
							φD	L
200 (250)	1	ECEA2DU010	±20	22.0	0.18	16	6.3	11.2
	2.2	ECEA2DU2R2		36.4	0.18	27	6.3	11.2
	3.3	ECEA2DU3R3		49.6	0.18	36	8	11.5
	4.7	ECEA2DU4R7		66.4	0.18	45	10	12.5
	10	ECEA2DU100		130.0	0.18	72	10	16
	22	ECEA2DU220		274.0	0.18	126	10	20
	33	ECEA2DU330W		406.0	0.18	160	12.5	20
	47	ECEA2DU470		574.0	0.18	193	12.5	25
	100	ECEA2DU101		1210.0	0.18	330	16	31.5
250 (300)	1	ECEA2EU010	±20	25.0	0.18	18	6.3	11.2
	2.2	ECEA2EU2R2		43.0	0.18	31	8	11.5
	3.3	ECEA2EU3R3		59.5	0.18	40	10	12.5
	4.7	ECEA2EU4R7		80.5	0.18	49	10	12.5
	10	ECEA2EU100W		160.0	0.18	81	10	16
	22	ECEA2EU220W		340.0	0.18	144	12.5	20
	33	ECEA2EU330		505.0	0.18	171	12.5	25
	47	ECEA2EU470		715.0	0.18	210	16	25
	100	ECEA2EU101W		1510.0	0.18	320	18	31.5
350 (400)	1	ECEA2VU010	±20	31.0	0.20	18	6.3	11.2
	2.2	ECEA2VU2R2		56.2	0.20	28	10	12.5
	3.3	ECEA2VU3R3		79.3	0.20	35	10	16
	4.7	ECEA2VU4R7		108.7	0.20	40	10	16
	10	ECEA2VU100		220.0	0.20	70	10	20
	22	ECEA2VU220		472.0	0.20	110	12.5	25
	33	ECEA2VU330		703.0	0.20	140	16	25
	47	ECEA2VU470		997.0	0.20	170	16	31.5
400 (450)	1	ECEA2GU010	±20	34.0	0.20	18	8	11.5
	2.2	ECEA2GU2R2		62.8	0.20	28	10	12.5
	3.3	ECEA2GU3R3		89.2	0.20	35	10	16
	4.7	ECEA2GU4R7		122.8	0.20	45	10	16
	10	ECEA2GU100		250.0	0.20	70	12.5	20
	22	ECEA2GU220		538.0	0.20	110	16	25
	33	ECEA2GU330		802.0	0.20	140	16	25
	47	ECEA2GU470		1138.0	0.20	170	16	31.5
450 (500)	1	ECEA2WU010	±20	37.0	0.20	19	10	12.5
	2.2	ECEA2WU2R2		69.4	0.20	29	10	16
	3.3	ECEA2WU3R3		99.1	0.20	35	10	20
	4.7	ECEA2WU4R7		136.9	0.20	50	12.5	20
	10	ECEA2WU100		280.0	0.20	75	12.5	25
	22	ECEA2WU220		604.0	0.20	110	16	31.5
	33	ECEA2WU330		901.0	0.20	150	18	31.5

IMPEDANCE CHARACTERISTICS (at + 20°C)









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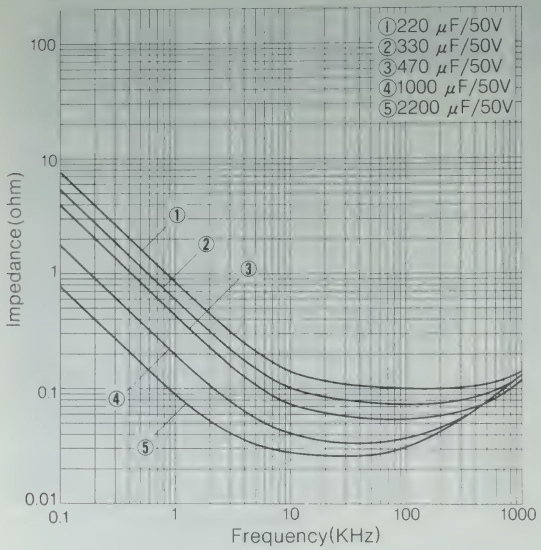
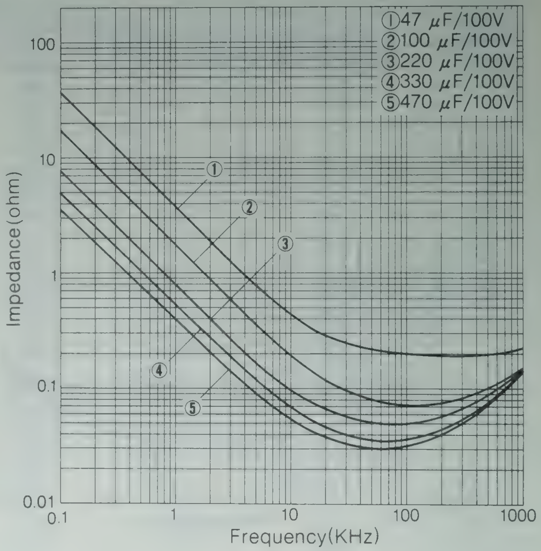
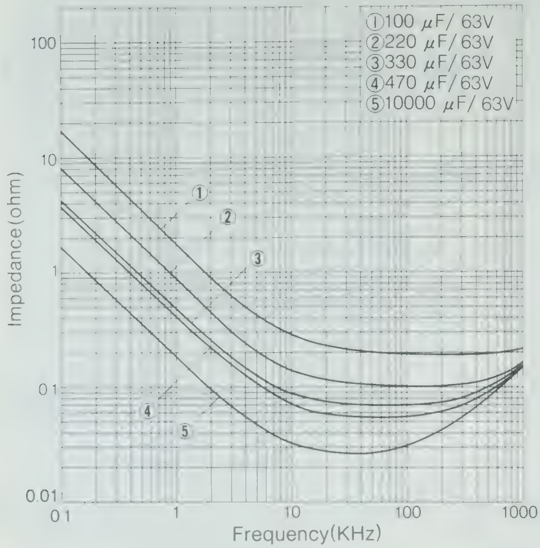






SU Series

Axial Leads Type

FEATURES

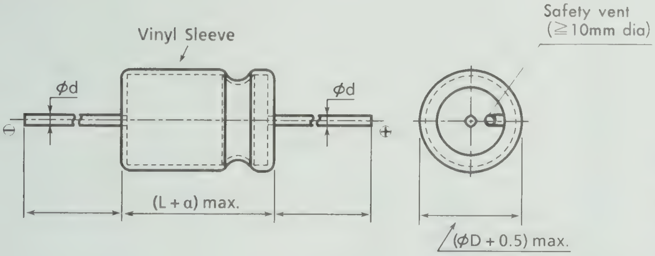
- **Standard Grade**
- **Life : 2000 hours at +85°C**
- **Fan Fold Box or Tape & Reel Packaging for Automatic Insertion**
- **Anti-solvent : Freon-TE, TES, TP35 or equivalents**

SPECIFICATIONS

Specifications for SU Series Axial Leads Type are the same as ones for SU Series Radial type except for modifications below. For dertails, refer to the specifications for SU Series Radial Leads Type.

Item	Performance Characteristics		
Rated Working Voltage Range	6.3V to 100V Rating	160V to 450V Rating	
Operating Temperature Range	−40°C to +85°C	−25°C to +85°C	
Ripple Current	Refer to standard products table for SU Series Axial Leads Type.		
High Temperature Loading	Post test requirements (+20°C)		
	Leakage current	≦ Initial specified value	
	Capacitance change	≦ ±20% (±25% for ϕD = 3.5mm) of initial measured value	
	tan δ	≦ 150% of initial specified value	
Shelf Life	Post test requirements (+20°C)		
	Leakage current	≦ Initial specified value	
	Capacitance change	≦ ±20% (±25% for ϕD = 3.5mm) of initial measured value	
	tan δ	≦ 150% of initial specified value	

DIMENSIONS



α	L
0.5 mm	7 mm
1.0 mm	≦ 16 mm
2.0 mm	≧ 20 mm

ϕD	3.5	4.5	6.3	8	10	12.5	16	18/22.4
ϕd	0.45	0.5	0.6	0.6	0.6	0.8	0.8	0.8

PART NUMBER SYSTEM

E C E B ☐ ☐ U ☐ ☐ ☐

W.V. Code			
Code	W.V.	Code	W.V.
0J	6.3	1J	63V
1A	10	2A	100V
1C	16	2C	100V
1E	25	2D	200V
1V	35	2E	250V
1H	50	2V	350V
		2G	400V
		2W	450V

Capacitance Code in μF	
First two digits	Significant figures
Third digits	Number of zeros following
An "R" in first two blocks	Decimal point. In this case all figures are significant

STANDARD PRODUCTS TABLE

W.V. (S.V.)	Cap. 〔μF〕	Part No.	Cap. tol. 〔%〕 (120Hz/+20°C)	D.C.L. 〔μA〕 (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current 〔mA〕 rms (120Hz/+85°C) max.	Dim. 〔mm〕	
							ϕD	L
6.3 (8)	22	ECEB0JU220S	±20	3.0	0.22	20.7	3.5	7
	33	ECEB0JU330S		3.0	0.22	50	4.5	10.5
	47	ECEB0JU470S		3.0	0.22	70	4.5	10.5
	100	ECEB0JU101S		6.3	0.22	100	4.5	10.5
	220	ECEB0JU221Y		13.8	0.22	240	6.3	10.5
	330	ECEB0JU331Y		20.7	0.22	300	6.3	10.5
	470	ECEB0JU471		29.6	0.22	380	8	16
	1,000	ECEB0JU102S		63.0	0.22	580	8	20
	2,200	ECEB0JU222		138.6	0.24	890	12.5	25
	3,300	ECEB0JU332		207.9	0.26	1,020	12.5	25
	4,700	ECEB0JU472		296.1	0.28	1170	12.5	31.5
	6,800	ECEB0JU682		428.4	0.32	1,270	16	31.5
	10,000	ECEB0JU103		630.0	0.40	1,450	16	40
	15,000	ECEB0JU153		945.0	0.50	1,700	18	40
	22,000	ECEB0JU223		1,386.0	0.64	2,000	22.4	40
10 (13)	22	ECEB1AU220S	±20	3.0	0.19	40	4.5	10.5
	33	ECEB1AU330S		3.3	0.19	60	4.5	10.5
	47	ECEB1AU470S		4.7	0.19	90	4.5	10.5
	100	ECEB1AU101Y		10.0	0.19	150	6.3	10.5
	220	ECEB1AU221Y		22.0	0.19	250	6.3	10.5
	330	ECEB1AU331		33.0	0.19	330	8	16
	470	ECEB1AU471		47.0	0.19	400	8	16
	1,000	ECEB1AU102		100.0	0.19	630	10	20
	2,200	ECEB1AU222		220.0	0.21	920	12.5	25
	3,300	ECEB1AU332		330.0	0.23	1,090	12.5	31.5
	4,700	ECEB1AU472		470.0	0.25	1,200	16	25
	6,800	ECEB1AU682		680.0	0.29	1,400	16	31.5
	10,000	ECEB1AU103		1,000.0	0.37	1,600	18	40
	15,000	ECEB1AU153		1,500.0	0.47	1,900	22.4	40
	22,000	ECEB1AU223		2,200.0	0.61	2,100	22.4	50
16 (20)	10	ECEB1CU100S	±20	3.0	0.16	19.6	3.5	7
	22	ECEB1CU220S		3.5	0.16	50	4.5	10.5
	33	ECEB1CU330S		5.2	0.16	80	4.5	10.5
	47	ECEB1CU470S		7.5	0.16	110	4.5	10.5
	100	ECEB1CU101Y		16.0	0.16	180	6.3	10.5
	220	ECEB1CU221		35.2	0.16	280	8	16
	330	ECEB1CU331		52.8	0.16	350	8	16
	470	ECEB1CU471		75.2	0.16	440	8	20
	1,000	ECEB1CU102		160.0	0.16	680	10	25
	2,200	ECEB1CU222		352.0	0.18	1,000	12.5	31.5
	3,300	ECEB1CU332		528.0	0.20	1,200	16	25
	4,700	ECEB1CU472		752.0	0.22	1,360	16	31.5
	6,800	ECEB1CU682		1,088.0	0.26	1,600	16	40
	10,000	ECEB1CU103		1,600.0	0.34	1,800	22.4	40
	15,000	ECEB1CU153		2,400.0	0.44	2,000	22.4	50

STANDARD PRODUCT TABLE

W.V. (S.V.)	Cap. 〔μF〕	Part No.	Cap. tol. 〔%〕 (120Hz/+20°C)	D.C.L. 〔μA〕 (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current 〔mA〕 rms (120Hz/+85°C) max	Dim. 〔mm〕	
							ϕD	L
25 (32)	2.2	ECEB1EU2R2S	±20	3.0	0.14	9.0	3.5	7
	3.3	ECEB1EU3R3S		3.0	0.14	11.2	3.5	7
	4.7	ECEB1EU4R7S		3.0	0.14	14.7	3.5	7
	10	ECEB1EU100S		3.0	0.14	40.0	4.5	10.5
	22	ECEB1EU220S		5.5	0.14	60	4.5	10.5
	33	ECEB1EU330S		8.2	0.14	90	4.5	10.5
	47	ECEB1EU470Y		11.7	0.14	130	6.3	10.5
	100	ECEB1EU101Y		25.0	0.14	180	6.3	10.5
	220	ECEB1EU221		55.0	0.14	310	8	16
	330	ECEB1EU331		82.5	0.14	390	8	20
	470	ECEB1EU471		117.5	0.14	480	10	20
	1,000	ECEB1EU102		250.0	0.14	850	12.5	25
	2,200	ECEB1EU222		550.0	0.16	1,200	16	25
	3,300	ECEB1EU332		825.0	0.18	1,300	16	31.5
	4,700	ECEB1EU472		1,175.0	0.20	1,500	18	40
	6,800	ECEB1EU682		1,700.0	0.24	1,700	22.4	40
	10,000	ECEB1EU103		2,500.0	0.32	1,800	22.4	50
35 (44)	4.7	ECEB1VU4R7S	±20	3.0	0.12	20	3.5	7
	10	ECEB1VU100S		3.5	0.12	45	4.5	10.5
	22	ECEB1VU220S		7.7	0.12	95	4.5	10.5
	33	ECEB1VU330Y		11.5	0.12	110	6.3	10.5
	47	ECEB1VU470Y		16.4	0.12	130	6.3	10.5
	100	ECEB1VU101		35.0	0.12	210	8	16
	220	ECEB1VU221		77.0	0.12	350	8	20
	330	ECEB1VU331		115.5	0.12	440	10	20
	470	ECEB1VU471		164.5	0.12	550	10	25
	1,000	ECEB1VU102		350.0	0.12	900	12.5	31.5
	2,200	ECEB1VU222		770.0	0.14	1,250	16	31.5
	3,300	ECEB1VU332		1,155.0	0.16	1,400	16	40
	4,700	ECEB1VU472		1,645.0	0.18	1,600	22.4	40
	6,800	ECEB1VU682		2,380.0	0.22	1,800	22.4	50
50 (63)	0.1	ECEB1HU0R1S	±20	3.0	0.10	0.7	3.5	7
	0.22	ECEB1HUR22S		3.0	0.10	1.6	3.5	7
	0.33	ECEB1HUR33S		3.0	0.10	2.5	3.5	7
	0.47	ECEB1HUR47S		3.0	0.10	3.5	3.5	7
	1	ECEB1HU010S		3.0	0.10	7.4	3.5	7
	2.2	ECEB1HU2R2S		3.0	0.10	12	3.5	7
	3.3	ECEB1HU3R3S		3.0	0.10	18	3.5	7
	4.7	ECEB1HU4R7S		3.0	0.10	30	4.5	10.5
	10	ECEB1HU100S		5.0	0.10	50	4.5	10.5
	22	ECEB1HU220Y		11.0	0.10	100	6.3	10.5
	33	ECEB1HU330Y		16.5	0.10	110	6.3	10.5
	47	ECEB1HU470Y		23.5	0.10	130	6.3	10.5
	100	ECEB1HU101		50.0	0.10	250	8	16
	220	ECEB1HU221		110.0	0.10	400	10	20
	330	ECEB1HU331		165.0	0.10	500	10	25
	470	ECEB1HU471		235.0	0.10	650	12.5	25
	1,000	ECEB1HU102		500.0	0.10	1,050	16	25
	2,200	ECEB1HU222		1,100.0	0.12	1,300	18	40
	3,300	ECEB1HU332		1,650.0	0.14	1,500	22.4	40
	4,700	ECEB1HU472		2,350.0	0.16	1,700	22.4	50

STANDARD PRODUCTS TABLE

W.V. (S.V.)	Cap. (μF)	Part No.	Cap. tol. (%) (120Hz/+20°C)	D.C.L. (μA) (+20°C/2 min) max.	tan δ (120Hz/+20°C) max.	Ripple Current (mA) rms (120Hz/+85°C) max.	Dim. (mm)	
							φD	L
63 (79)	10	ECEB1JU100S	±20	6.3	0.09	55	4.5	10.5
	22	ECEB1JU220Y		13.8	0.09	130	6.3	10.5
	33	ECEB1JU330Y		20.7	0.09	130	6.3	10.5
	47	ECEB1JU470		29.6	0.09	160	8	16
	100	ECEB1JU101		63.0	0.09	270	8	20
	220	ECEB1JU221		138.6	0.09	450	10	25
	330	ECEB1JU331		207.9	0.09	550	12.5	25
	470	ECEB1JU471		296.1	0.09	750	12.5	31.5
	1,000	ECEB1JU102		630.0	0.09	1,100	16	31.5
	2,200	ECEB1JU222		1,386.0	0.11	1,400	22.4	40
	3,300	ECEB1JU332		2,079.0	0.13	1,600	22.4	50
100 (125)	0.1	ECEB2AU0R1S	±20	3.0	0.08	1.5	4.5	10.5
	0.22	ECEB2AUR22S		3.0	0.08	3.8	4.5	10.5
	0.33	ECEB2AUR33S		3.0	0.08	5.0	4.5	10.5
	0.47	ECEB2AUR47S		3.0	0.08	10	4.5	10.5
	1	ECEB2AU010S		3.0	0.08	16	4.5	10.5
	2.2	ECEB2AU2R2S		3.0	0.08	24	4.5	10.5
	3.3	ECEB2AU3R3S		3.3	0.08	32	4.5	10.5
	4.7	ECEB2AU4R7S		4.7	0.08	40	4.5	10.5
	10	ECEB2AU100Y		10.0	0.08	70	6.3	10.5
	22	ECEB2AU220		22.0	0.08	115	8	16
	33	ECEB2AU330		33.0	0.08	145	8	16
	47	ECEB2AU470		47.0	0.08	180	8	20
	100	ECEB2AU101		100.0	0.08	350	10	25
	220	ECEB2AU221		220.0	0.08	550	12.5	31.5
	330	ECEB2AU331		330.0	0.08	700	16	25
	470	ECEB2AU471		470.0	0.08	900	16	40
	1,000	ECEB2AU102		1,000.0	0.08	1,050	22.4	40
160 (200)	1	ECEB2CU010	±20	19.6	0.16	13	6.3	10.5
	2.2	ECEB2CU2R2		31.1	0.16	22	6.3	16
	3.3	ECEB2CU3R3		41.6	0.16	31	6.3	16
	4.7	ECEB2CU4R7		55.1	0.16	40	6.3	16
	10	ECEB2CU100		106.0	0.16	63	8	20
	22	ECEB2CU220		221.2	0.16	108	10	20
	33	ECEB2CU330		326.8	0.16	144	10	25
	47	ECEB2CU470		461.2	0.16	180	12.5	25
	100	ECEB2CU101		970.0	0.16	270	16	25
	220	ECEB2CU221		2,122.0	0.16	400	18	40
	330	ECEB2CU331		3,178.0	0.16	490	22.4	40
	470	ECEB2CU471		4,522.0	0.16	570	22.4	50
200 (250)	1	ECEB2DU010	±20	22.0	0.18	16	6.3	10.5
	2.2	ECEB2DU2R2		36.4	0.18	27	6.3	16
	3.3	ECEB2DU3R3		49.6	0.18	36	8	16
	4.7	ECEB2DU4R7		66.4	0.18	45	8	16
	10	ECEB2DU100		130.0	0.18	72	10	20
	22	ECEB2DU220		274.0	0.18	126	10	25
	33	ECEB2DU330		406.0	0.18	157	12.5	25
	47	ECEB2DU470		574.0	0.18	193	12.5	25
	100	ECEB2DU101		1,200.0	0.18	306	16	31.5
	220	ECEB2DU221		1,650.0	0.18	440	18	40
	330	ECEB2DU331		3,970.0	0.18	540	22.4	50

SU Series

STANDARD PRODUCTS TABLE

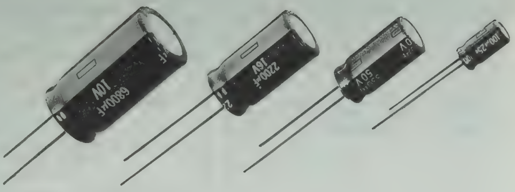
W.V. (S.V.)	Cap. (μF)	Part No.	Cap. tol.(%) (120Hz/20°C)	D.C.L.(μA) (20°C/2min) max.	tan δ (120Hz/20°C) max.	Ripple Current (mA)rms (120Hz/85°C) max.	Dim.(mm)	
							φD	L
250 (300)	1	ECEB2EU010	±20	25.0	0.18	18	6.3	16
	2.2	ECEB2EU2R2		43.0	0.18	31	8	16
	3.3	ECEB2EU3R3		59.5	0.18	40	8	16
	4.7	ECEB2EU4R7		80.5	0.18	49	8	20
	10	ECEB2EU100		160.0	0.18	81	10	20
	22	ECEB2EU220		340.0	0.18	144	12.5	25
	33	ECEB2EU330		505.0	0.18	171	12.5	25
	47	ECEB2EU470		715.0	0.18	207	12.5	31.5
	100	ECEB2EU101		1510.0	0.18	320	16	40
	220	ECEB2EU221		3310.0	0.18	500	22.4	40
350 (400)	1	ECEB2VU010	±20	31.0	0.20	20	6.3	16
	2.2	ECEB2VU2R2		56.2	0.20	36	8	20
	3.3	ECEB2VU3R3		79.3	0.20	44	10	20
	4.7	ECEB2VU4R7		108.7	0.20	60	10	20
	10	ECEB2VU100		220.0	0.20	96	12.5	25
	22	ECEB2VU220		472.0	0.20	160	16	25
	33	ECEB2VU330		703.0	0.20	200	16	31.5
	47	ECEB2VU470		997.0	0.20	240	16	40
	100	ECEB2VU101		2110.0	0.20	350	22.4	40
400 (450)	1	ECEB2GU010	±20	34.0	0.20	21	8	16
	2.2	ECEB2GU2R2		62.8	0.20	36	8	20
	3.3	ECEB2GU3R3		89.2	0.20	46	10	20
	4.7	ECEB2GU4R7		122.8	0.20	61	10	25
	10	ECEB2GU100		250.0	0.20	100	12.5	25
	22	ECEB2GU220		538.0	0.20	160	16	31.5
	33	ECEB2GU330		802.0	0.20	205	16	40
	47	ECEB2GU470		1138.0	0.20	260	18	40
	100	ECEB2GU101		2410.0	0.20	370	22.4	50
450 (500)	1	ECEB2WU010	±20	37.0	0.20	21	8	16
	2.2	ECEB2WU2R2		69.4	0.20	38	10	20
	3.3	ECEB2WU3R3		99.1	0.20	49	10	25
	4.7	ECEB2WU4R7		136.9	0.20	63	12.5	25
	10	ECEB2WU100		280.0	0.20	105	16	25
	22	ECEB2WU220		604.0	0.20	161	16	40
	33	ECEB2WU330		901.0	0.20	210	18	40
	47	ECEB2WU470		1279.0	0.20	260	22.4	50

NHE Series

Radial Leads Type

FEATURES

- **Life : 2000 hours at +105°C with ripple current applied**
- **Wide Range of Operating Temperature : –55°C to +105°C**
- **Miniaturized Size : Same Size as Standard Grade "SU Series" for the same rating**
- **Anti-solvent : Freon-TE, TES, TP35 or equivalents For ratings of 6.3V to 100VDC**



SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="2">Performance Characteristics</th></tr>
<tr><td>Rated Working Voltage Range</td><td>6.3V to 100V DC</td><td>160V to 450V DC</td></tr>
<tr><td>Operating Temperature Range</td><td>–55°C to +105°C</td><td>–25°C to +105°C</td></tr>
<tr><td>Nominal Capacitance Range</td><td colspan="2">0.1 to 15000 [μF]</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="2">±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td colspan="2">
<table>
<tr><td>leakage current</td><td>Rated working voltage</td></tr>
<tr><td>I ≤ 0.01CV or 3 [μA]</td><td>6.3V to 100V DC</td></tr>
<tr><td>I ≤ 0.06CV + 10 [μA]</td><td>160V to 450V DC</td></tr>
</table>
whichever is greater measured after a 2 minute application of rated working voltage at +20°C(C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td colspan="2">
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≤</td><td>0.22</td><td>0.19</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.10</td><td>0.09</td></tr>
</table>
<table>
<tr><td>Rated working voltage [V]</td><td>100</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≤</td><td>0.07</td><td>0.15</td><td>0.15</td><td>0.15</td><td>0.20</td><td>0.24</td><td>0.24</td></tr>
</table>
For capacitance > 1000μF, add 0.02 per another 1000μF</td></tr>
<tr><td>Surge Voltage</td><td colspan="2">
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr>
<tr><td>Surge voltage [V]</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td><td>79</td></tr>
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<table>
<tr><td>Rated working voltage [V]</td><td>100</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>Surge voltage [V]</td><td>125</td><td>200</td><td>250</td><td>300</td><td>400</td><td>450</td><td>500</td></tr>
</table></td></tr>
<tr><td>Characteristics at Low Temperature</td><td colspan="2">
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr>
<tr><td rowspan="3">Impedance Ratio (120Hz) : ≤</td><td>–25°C / +20°C</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>–40°C / +20°C</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>–55°C / +20°C</td><td>12</td><td>10</td><td>8</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td></tr>
</table>
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>Impedance Ratio (120Hz) : ≤</td><td>–25°C / +20°C</td><td>3</td><td>3</td><td>3</td><td>6</td><td>6</td><td>15</td></tr>
</table></td></tr>
<tr><td>Ripple Current</td><td colspan="2">Refer to tabulated standard products table</td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Ripple Current Correction Factor for Frequency</td><td>Correction factor (multiplier)
<table>
<tr><th>Rated W.V. [V]</th><th>Frequency [Hz]
Capacitance range [μF]</th><th>60</th><th>120</th><th>1k</th><th>10k</th><th>100k</th></tr>
<tr><td>63 - 50</td><td>0.1 - 330</td><td>0.85</td><td>1</td><td>1.30</td><td>1.40</td><td>1.55</td></tr>
<tr><td></td><td>470 - 3 300</td><td>0.95</td><td>1</td><td>1.15</td><td>1.20</td><td>1.25</td></tr>
<tr><td></td><td>≧ 4 700</td><td>0.95</td><td>1</td><td>1.10</td><td>1.20</td><td>1.20</td></tr>
<tr><td>63 - 100</td><td>0.47 - 33</td><td>0.75</td><td>1</td><td>1.55</td><td>1.65</td><td>1.80</td></tr>
<tr><td></td><td>47 - 220</td><td>0.75</td><td>1</td><td>1.40</td><td>1.60</td><td>1.65</td></tr>
<tr><td></td><td>≧ 330</td><td>0.80</td><td>1</td><td>1.30</td><td>1.35</td><td>1.40</td></tr>
<tr><td>≧ 160</td><td>–</td><td>0.70</td><td>1</td><td>1.30</td><td>1.70</td><td>1.70</td></tr>
</table></td></tr>
<tr><td>High Temperature Loading</td><td>Test conditions
<table>
<tr><td>Duration</td><td>2000h (1000h for case diameter ≦ ϕ8 [mm])</td></tr>
<tr><td>Ambient temperature</td><td>+105°C</td></tr>
<tr><td>Applied voltage</td><td>DC voltage with maximum permissible ripple current specified at +105°C (Sum of the DC voltage and superimposed peak AC voltage for rated ripple current should be equal to rated DC working voltage.)</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Shelf Life</td><td>Test conditions
<table>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+105°C ±2°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td></tr>
</table>
Post test conditioning by application of voltage
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Ambient temperature</td><td>+20°C</td></tr>
<tr><td>Discharge after application of voltage</td><td>Discharge through a resistor</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements at +20°C (after post test conditioning)
<table>
<tr><td>Leakage current</td><td>≦ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors for ratings of 6.3V to 100V DC shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><th>Solvents / Conditions</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≦ 5 min (total)</td><td>≦ boiling point at 1 atm</td><td>Acceptable</td></tr>
</table></td></tr>
</table>

SPECIFICATIONS (continued)

Item	Performance Characteristics
Other Items	Unless otherwise specified herein, conform to Panasonic Specifications and/or JIS-C-5141 where it is applicable.

PART NUMBER SYSTEM

E C E A □ □ G E □ □ □ □

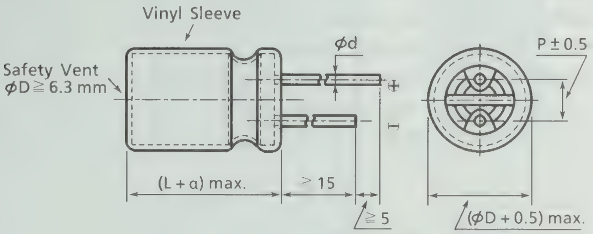
Working Voltage Code	
Code	W. V.
0J	6.3V
1A	10V
1C	16V
1E	25V
1V	35V
1H	50V
1J	63V
2A	100V
2C	160
2D	200
2E	250
2V	350
2G	400
2W	450

Capacitance Code in μF	
First two digits	Significant figures (where necessary. zero is preceded)
Third digit	Number of zeros to follow
"R" in three-digit block	Decimal point (where necessary, "R" is used as a decimal point. In this case, other two figures are significant.

<table>
<tr><th colspan="3">Suffix for Configuration</th></tr>
<tr><th>Suffix</th><th>Configuration</th><th>Packaging</th></tr>
<tr><td>(none)</td><td>Long lead</td><td>Bulk</td></tr>
<tr><td>※E</td><td>Snap-in lead
<table>
<tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr>
<tr><td>5mm</td><td>ϕD : 5 to 12.5</td></tr>
<tr><td>7.5mm</td><td>ϕD : 16 to 18</td></tr>
</table></td><td>Bulk</td></tr>
<tr><td>※B</td><td>Taping
<table>
<tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr>
<tr><td>5mm</td><td>ϕD : 5 to 12.5</td></tr>
<tr><td>7.5mm</td><td>ϕD : 16 to 18
(L : ≦ 25)</td></tr>
</table></td><td>Fan fold box
<table>
<tr><th>ϕD</th><th>Pcs/box</th></tr>
<tr><td>5 - 6.3</td><td>2 000</td></tr>
<tr><td>8</td><td>1 000</td></tr>
<tr><td>10 - 12.5</td><td>500</td></tr>
<tr><td>16 - 18</td><td>250</td></tr>
</table></td></tr>
<tr><td>※I</td><td>Taping
<table>
<tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr>
<tr><td>2.5mm</td><td>ϕD : 5 to 6.3</td></tr>
</table></td><td>Fan fold box
<table>
<tr><th>ϕD</th><th>Pcs/box</th></tr>
<tr><td>5 - 6.3</td><td>2 000</td></tr>
</table></td></tr>
</table>

※ Not standard

DIMENSIONS



ϕD	5	6.3	8	10	12.6	16	18
ϕd	0.5	0.5	0.6	0.6	0.6	0.8	0.8
P	2	2.5	3.5	5	5	7.5	7.5

α	L
1.0 mm	≦ 16 mm
2.0 mm	≧ 20mm

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions φD×L [mm]	Maximum Permissible Ripple Current (120Hz, 105°C) [mA rms]
6.3	100	ECEA0JGE101	5×11	91
	220	ECEA0JGE221	6.3×11.2	150
	330	ECEA0JGE331	6.3×11.2	230
	470	ECEA0JGE471	8×12.5	250
	1 000	ECEA0JGE102	10×12.5	450
	2 200	ECEA0JGE222	12.5×20	780
	3 300	ECEA0JGE332	12.5×20	920
	4 700	ECEA0JGE472	16×25	1 150
	6 800	ECEA0JGE682	16×25	1 440
	10 000	ECEA0JGE103	16×31.5	1 700
	15 000	ECEA0JGE153	18×35.5	1 910
10	100	ECEA1AGE101	5×11	110
	220	ECEA1AGE221	6.3×11.2	160
	330	ECEA1AGE331	8×11.5	230
	470	ECEA1AGE471	8×12.5	270
	1 000	ECEA1AGE102	10×16	500
	2 200	ECEA1AGE222	12.5×20	850
	3 300	ECEA1AGE332	12.5×25	1 080
	4 700	ECEA1AGE472	16×25	1270
	6 800	ECEA1AGE682	16×31.5	1 530
	10 000	ECEA1AGE103	18×35.5	1 840
16	10	ECEA1CGE100	5×11	31
	22	ECEA1CGE220	5×11	45
	33	ECEA1CGE330	5×11	55
	47	ECEA1CGE470	5×11	77
	100	ECEA1CGE101	6.3×11.2	120
	220	ECEA1CGE221	8×11.5	210
	330	ECEA1CGE331	8×12.5	260
	470	ECEA1CGE471	10×12.5	330
	1 000	ECEA1CGE102	10×20	600
	2 200	ECEA1CGE222	12.5×25	1 010
	3 300	ECEA1CGE332	16×25	1 210
	4 700	ECEA1CGE472	16×31.5	1 490
	6 800	ECEA1CGE682	18×35.5	1 740

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions φD×L [mm]	Maximum Permissible Ripple Current (120Hz, 105°C) [mA rms]
25	22	ECEA1EGE220	5×11	49
	33	ECEA1EGE330	5×11	59
	47	ECEA1EGE470	5×11	91
	100	ECEA1EGE101	6.3×11.2	130
	220	ECEA1EGE221	8×12.5	220
	330	ECEA1EGE331	10×12.5	300
	470	ECEA1EGE471	10×16	410
	1 000	ECEA1EGE102	12.5×20	720
	2 200	ECEA1EGE222	16×25	1 110
	3 300	ECEA1EGE332	16×31.5	1 380
	4 700	ECEA1EGE472	18×35.5	1 690
35	4.7	ECEA1VGE4R7	5×11	24
	10	ECEA1VGE100	5×11	35
	22	ECEA1VGE220	5×11	52
	33	ECEA1VGE330	5×11	84
	47	ECEA1VGE470	6.3×11.2	98
	100	ECEA1VGE101	8×11.5	160
	220	ECEA1VGE221	10×12.5	260
	330	ECEA1VGE331	10×16	360
	470	ECEA1VGE471	10×20	480
	1 000	ECEA1VGE102	12.5×25	840
	2 200	ECEA1VGE222	16×31.5	1 270
	3 300	ECEA1VGE332	18×35.5	1 540
50	0.1	ECEA1HGE0R1	5×11	1.1
	0.22	ECEA1HGER22	5×11	2.3
	0.33	ECEA1HGER33	5×11	3.5
	0.47	ECEA1HGER47	5×11	5
	1	ECEA1HGE010	5×11	10
	2.2	ECEA1HGE2R2	5×11	18
	3.3	ECEA1HGE3R3	5×11	22
	4.7	ECEA1HGE4R7	5×11	26
	10	ECEA1HGE100	5×11	39
	22	ECEA1HGE220	5×11	70
	33	ECEA1HGE330	6.3×11.2	91
	47	ECEA1HGE470	6.3×11.2	100
	100	ECEA1HGE101	8×12.5	170
	220	ECEA1HGE221	10×16	330
	330	ECEA1HGE331	10×20	440
	470	ECEA1HGE471	12.5×20	580
	1 000	ECEA1HGE102	16×25	940
	2 200	ECEA1HGE222	18×35.5	1 490

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (120Hz, 105°C) [mA rms]
63	4.7	ECEA1JGE4R7	5×11	28
	10	ECEA1JGE100	5×11	51
	22	ECEA1JGE220	6.3×11.2	84
	33	ECEA1JGE330	6.3×11.2	98
	47	ECEA1JGE470	8×11.5	130
	100	ECEA1JGE101	10×12.5	210
	220	ECEA1JGE221	10×20	400
	330	ECEA1JGE331	12.5×20	550
	470	ECEA1JGE471	12.5×25	700
	1 000	ECEA1JGE102	16×31.5	1 130
100	0.47	ECEA2AGER47	5×11	9
	1	ECEA2AGE010	5×11	14
	2.2	ECEA2AGE2R2	5×11	21
	3.3	ECEA2AGE3R3	5×11	31
	4.7	ECEA2AGE4R7	5×11	38
	10	ECEA2AGE100	6.3×11.2	61
	22	ECEA2AGE220	8×11.5	98
	33	ECEA2AGE330	10×12.5	130
	47	ECEA2AGE470	10×16	160
	100	ECEA2AGE101	12.5×20	280
	220	ECEA2AGE221	16×25	510
	330	ECEA2AGE331	16×25	650
	470	ECEA2AGE471	16×31.5	880
160	0.47	ECEA2CGER47	6.3×11.2	12
	1	ECEA2CGE010	6.3×11.2	17
	2.2	ECEA2CGE2R2	6.3×11.2	25
	3.3	ECEA2CGE3R3	8×11.5	36
	4.7	ECEA2CGE4R7	8×11.5	43
	10	ECEA2CGE100	10×12.5	70
	22	ECEA2CGE220	10×20	130
	33	ECEA2CGE330	12.5×20	180
	47	ECEA2CGE470	12.5×25	220
	100	ECEA2CGE101	16×25	330
	220	ECEA2CGE221U	18×31.5	500

STANDARD PRODUCTS TABLE

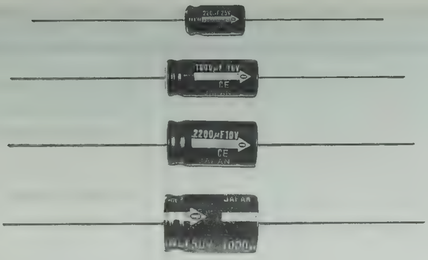
Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible Ripple Current (120Hz, 105°C) [mA rms]
200	0.47	ECEA2DGER47	6.3 × 11.2	12
	1	ECEA2DGE010	6.3 × 11.2	17
	2.2	ECEA2DGE2R2	6.3 × 11.2	25
	3.3	ECEA2DGE3R3	8 × 11.5	36
	4.7	ECEA2DGE4R7	10 × 12.5	50
	10	ECEA2DGE100	10 × 16	80
	22	ECEA2DGE220	10 × 20	140
	33	ECEA2DGE330	12.5 × 25	190
	47	ECEA2DGE470	12.5 × 25	220
	100	ECEA2DGE101	16 × 31.5	335
250	0.47	ECEA2EGER47	6.3 × 11.2	12
	1	ECEA2EGE010	6.3 × 11.2	17
	2.2	ECEA2EGE2R2	8 × 11.5	29
	3.3	ECEA2EGE3R3	10 × 12.5	42
	4.7	ECEA2EGE4R7	10 × 12.5	50
	10	ECEA2EGE100	10 × 20	88
	22	ECEA2EGE220	12.5 × 25	155
	33	ECEA2EGE330	12.5 × 25	190
	47	ECEA2EGE470	16 × 25	230
	100	ECEA2EGE101U	18 × 31.5	340
350	0.47	ECEA2VGER47	8 × 11.5	11
	1	ECEA2VGE010	10 × 12.5	18
	2.2	ECEA2VGE2R2	10 × 16	31
	3.3	ECEA2VGE3R3	10 × 16	38
	4.7	ECEA2VGE4R7	10 × 20	49
	10	ECEA2VGE100	12.5 × 20	82
	22	ECEA2VGE220Z	16 × 25	130
	33	ECEA2VGE330	16 × 25	175
	47	ECEA2VGE470U	16 × 31.5	230
400	0.47	ECEA2GGER47	8 × 11.5	11
	1	ECEA2GGE010	10 × 12.5	18
	2.2	ECEA2GGE2R2	10 × 16	30
	3.3	ECEA2GGE3R3	10 × 20	40
	4.7	ECEA2GGE4R7	10 × 20	45
	10	ECEA2GGE100	12.5 × 25	79
	22	ECEA2GGE220	16 × 25	145
	33	ECEA2GGE330	16 × 31.5	185
	47	ECEA2GGE470	18 × 31.5	230

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions φD×L [mm]	Maximum Permissible Ripple Current (120Hz, 105°C) [mA rms]
450	1	ECEA2WGE010	10×16	18
	2.2	ECEA2WGE2R2	10×20	29
	3.3	ECEA2WGE3R3	12.5×20	41
	4.7	ECEA2WGE4R7	12.5×20	449
	10	ECEA2WGE100	16×25	75
	22	ECEA2WGE220	16×31.5	115
	33	ECEA2WGE330U	18×31.5	145

NHE Series

Axial Leads Type



FEATURES

- Life : 2000 hours at +105°C with ripple current applied
- Wide Range of Operating Temperature from −55°C to +105°C
- Miniaturized Size : same size as standard grade "SU Series" for the same rating
- Anti-Solvent : Freon-TE, TES, TP35 or equivalents

SPECIFICATIONS

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Rated Working Voltage Range</td><td>6.3V to 100V DC</td></tr>
<tr><td>Operating Temperature Range</td><td>−55°C to +105°C</td></tr>
<tr><td>Nominal Capacitance Range</td><td>0.1 to 15 000μF</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td>I ≦ 0.01CV or 3 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C(C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td>
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr>
<tr><td>tan δ (120Hz, +20°C) ≦</td><td>0.28</td><td>0.22</td><td>0.19</td><td>0.16</td><td>0.13</td><td>0.10</td><td>0.09</td><td>0.07</td></tr>
</table>
For capacitance value > 1000μF, add 0.02 per another 1000μF.</td></tr>
<tr><td>Surge Voltage</td><td>
<table>
<tr><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr>
<tr><td>Surge voltage [V]</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td><td>79</td><td>125</td></tr>
</table></td></tr>
<tr><td>Characteristics at Low Temperature</td><td>
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr>
<tr><td rowspan="3">Impedance ratio (120Hz) : ≦</td><td>−25°C / +20°C</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>−40°C / +20°C</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>−55°C / +20°C</td><td>12</td><td>10</td><td>8</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td></tr>
</table></td></tr>
<tr><td>Ripple Current</td><td>Refer to standard products table.</td></tr>
<tr><td>Ripple Current Correction Factor for Frequency</td><td>
<table>
<tr><td>Rated W.V. [V]</td><td>Capacitance range [μF] / Frequency [Hz]</td><td>60</td><td>120</td><td>1k</td><td>10k</td><td>100k</td></tr>
<tr><td rowspan="3">63 - 50</td><td>0,1 - 330</td><td>0.85</td><td>1</td><td>1.30</td><td>1.40</td><td>1.55</td></tr>
<tr><td>470 - 3 300</td><td>0.95</td><td>1</td><td>1.15</td><td>1.20</td><td>1.25</td></tr>
<tr><td>≥ 4 700</td><td>0.95</td><td>1</td><td>1.10</td><td>1.20</td><td>1.20</td></tr>
<tr><td rowspan="3">63 - 100</td><td>0.47 - 33</td><td>0.75</td><td>1</td><td>1.55</td><td>1.65</td><td>1.80</td></tr>
<tr><td>47 - 220</td><td>0.75</td><td>1</td><td>1.40</td><td>1.60</td><td>1.65</td></tr>
<tr><td>≥ 330</td><td>0.80</td><td>1</td><td>1.30</td><td>1.35</td><td>1.40</td></tr>
</table></td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Temperature Loading</td><td>Test conditions
<table>
<tr><td>Duration</td><td>2000h (1000h for ϕD ≤ 8mm)</td></tr>
<tr><td>Ambient temperature</td><td>+105°C</td></tr>
<tr><td>Applied voltage</td><td>DC voltage with maximum permissible ripple current specified at +105°C (Sum of the DC voltage and super-imposed peak AC voltage for rated ripple current should be equal to rated DC working voltage.)</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tanδ</td><td>≤ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Shelf Life</td><td>Test conditions
<table>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+105°C ±2°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td></tr>
</table>
Post test conditioning by application of voltage
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Ambient temperature</td><td>+20°C</td></tr>
<tr><td>Discharge after application of voltage</td><td>Discharge through a resistor</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements at +20°C (after post test conditioning)
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors shall be capable of withstanding exposure to following cleaning solvents
<table>
<tr><th>Conditions
Solvents</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≤ 5 min (total)</td><td>≤ boiling point at 1 atm</td><td>Acceptable</td></tr>
</table></td></tr>
</table>

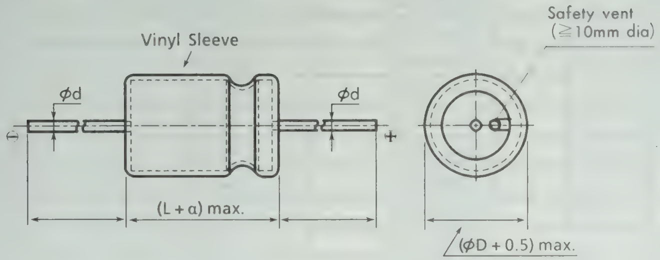
PART NUMBER SYSTEM

E C E B □ □ G E □ □ □

Working Voltage Code	
Code	W. V.
0J	6.3V
1A	10V
1C	16V
1E	25V
1V	35V
1H	50V
1J	63V
2A	100V

Capacitance Code in μF	
First two digits	Significant figures (where necessary. zero is preceded)
Third digit	Number of zeros to follow
"R" in three-digit block	Decimal point (where necessary, "R" is used as a decimal point. In this case, other two figures are significant.

DIMENSIONS



α	L
1.0 mm	≦ 16 mm
2.0 mm	≧ 20 mm

φD	5	6.3	8	10	12.5	16	18
φd	0.6	0.6	0.6	0.6	0.8	0.8	0.8

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Ripple Current Max. (120Hz, 105°C) [mA rms]
6.3	100	ECEB0JGE101	6.3×12.5	91
	220	ECEB0JGE221	6.3×16	150
	330	ECEB0JGE331	8×16	230
	470	ECEB0JGE471	8×16	250
	1 000	ECEB0JGE102	10×20	450
	2 200	ECEB0JGE222	12.5×25	780
	3 300	ECEB0JGE332	12.5×25	920
	4 700	ECEB0JGE472	12.5×31.5	1 150
	6 800	ECEB0JGE682	16×31.5	1 440
	10 000	ECEB0JGE103	16×40	1 700
	15 000	ECEB0JGE153	18×40	1 910
10	22	ECEB1AGE220	5×12.5	41
	33	ECEB1AGE330	6.3×12.5	50
	47	ECEB1AGE470	6.3×12.5	60
	100	ECEB1AGE101	6.3×16	110
	220	ECEB1AGE221	6.3×16	160
	330	ECEB1AGE331	8×16	230
	470	ECEB1AGE471	8×16	270
	1 000	ECEB1AGE102	10×20	500
	2 200	ECEB1AGE222	12.5×25	850
	3 300	ECEB1AGE332	12.5×31.5	1 080
	4 700	ECEB1AGE472	16×25	1 270
	6 800	ECEB1AGE682	16×31.5	1 530
	10 000	ECEB1AGE103	18×40	1 840
16	22	ECEB1CGE220	6.3×12.5	46
	33	ECEB1CGE330	6.3×12.5	57
	47	ECEB1CGE470	6.3×16	77
	100	ECEB1CGE101	6.3×16	120
	220	ECEB1CGE221	8×16	210
	330	ECEB1CGE331	8×16	260
	470	ECEB1CGE471	8×20	330
	1 000	ECEB1CGE102	10×25	600
	2 200	ECEB1CGE222	12.5×31.5	1 010
	3 300	ECEB1CGE332	16×25	1 210
	4 700	ECEB1CGE472	16×31.5	1 490
	6 800	ECEB1CGE682	16×40	1 740

STANDARD PRODUCT TABLE

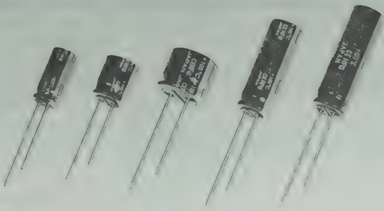
Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Ripple Current Max. (120Hz, 105°C) [mA rms]
25	4.7	ECEB1EGE4R7	5×12.5	22
	10	ECEB1EGE100	5×12.5	33
	22	ECEB1EGE220	6.3×12.5	49
	33	ECEB1EGE330	6.3×16	70
	47	ECEB1EGE470	6.3×16	91
	100	ECEB1EGE101	6.3×16	130
	220	ECEB1EGE221	8×16	220
	330	ECEB1EGE331	8×20	300
	470	ECEB1EGE471	10×20	410
	1 000	ECEB1EGE102	12.5×25	720
	2 200	ECEB1EGE222	16×25	1 110
	3 300	ECEB1EGE332	16×31.5	1 380
	4 700	ECEB1EGE472	18×40	1 690
35	4.7	ECEB1VGE4R7	5×12.5	24
	10	ECEB1VGE100	6.3×12.5	36
	22	ECEB1VGE220	6.3×16	62
	33	ECEB1VGE330	6.3×16	84
	47	ECEB1VGE470	6.3×16	98
	100	ECEB1VGE101	8×16	160
	220	ECEB1VGE221	8×20	260
	330	ECEB1VGE331	10×20	360
	470	ECEB1VGE471	10×25	480
	1 000	ECEB1VGE102	12.5×31.5	840
	2 200	ECEB1VGE222	16×31.5	1 270
	3 300	ECEB1VGE332	16×40	1 540
50	0.1	ECEB1HGE0R1	5×12.5	1.1
	0.22	ECEB1HGER22	5×12.5	2.3
	0.33	ECEB1HGER33	5×12.5	3.5
	0.47	ECEB1HGER47	5×12.5	5
	1	ECEB1HGE010	5×12.5	10
	2.2	ECEB1HGE2R2	5×12.5	18
	3.3	ECEB1HGE3R3	5×12.5	22
	4.7	ECEB1HGE4R7	6.3×12.5	26
	10	ECEB1HGE100	6.3×16	39
	22	ECEB1HGE220	6.3×16	70
	33	ECEB1HGE330	6.3×16	91
	47	ECEB1HGE470	6.3×16	100

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD × L [mm]	Ripple Current Max. (120Hz, 105°C) [mA rms]
50 (contd.)	100	ECEB1HGE101	8 × 16	170
	220	ECEB1HGE221	10 × 20	330
	330	ECEB1HGE331	10 × 25	440
	470	ECEB1HGE471	12.5 × 25	580
	1 000	ECEB1HGE102	16 × 25	940
	2 200	ECEB1HGE222	18 × 40	1 490
63	2.2	ECEB1JGE2R2	5 × 12.5	20
	3.3	ECEB1JGE3R3	6.3 × 12.5	25
	4.7	ECEB1JGE4R7	6.3 × 12.5	30
	10	ECEB1JGE100	6.3 × 16	51
	22	ECEB1JGE220	6.3 × 16	84
	33	ECEB1JGE330	6.3 × 16	98
	47	ECEB1JGE470	8 × 16	130
	100	ECEB1JGE101	8 × 20	210
	220	ECEB1JGE221	10 × 25	400
	330	ECEB1JGE331	12.5 × 25	550
	470	ECEB1JGE471	12.5 × 31.5	700
	1 000	ECEB1JGE102	16 × 31.5	1 130
100	0.47	ECEB2AGER47	5 × 12.5	9
	1	ECEB2AGE010	5 × 12.5	14
	2.2	ECEB2AGE2R2	6.3 × 12.5	21
	3.3	ECEB2AGE3R3	6.3 × 16	31
	4.7	ECEB2AGE4R7	6.3 × 16	38
	10	ECEB2AGE100	6.3 × 16	61
	22	ECEB2AGE220	8 × 16	98
	33	ECEB2AGE330	8 × 20	130
	47	ECEB2AGE470	8 × 20	160
	100	ECEB2AGE101	10 × 25	280
	220	ECEB2AGE221	12.5 × 31.5	510
	330	ECEB2AGE331	16 × 25	650
	470	ECEB2AGE471	16 × 40	880

HFQ Series

FEATURES



- Life : 2000 hours at +105°C with ripple current applied
- Low Impedance at High Frequency and Low Temperature
- Wide Range of Operating Temperature from −55°C to +105°C
- Anti-solvent : Freon-TE, TES, TP35 or equivalents

SPECIFICATIONS

Item	Performance Characteristics
Operating Temperature Range	−55°C to +105°C
Rated Working Voltage Range	6.3V to 63V DC
Nominal Capacitance Range	6.8μF to 15 000μF (120Hz, +20°C)
Capacitance Tolerance	±20% (120Hz, +20°C)
Leakage Current	I ≤ 0.01CV or 3 [μA] Whichever is greater measured after a 2 minute application of rated working voltage at +20°C .(C = nominal capacitance in micro-farads, V = rated working voltage in volts)
Tangent of Loss Angle	See table below. For capacitance value > 1 000μF, add 0.02 per another 1 000μF.
Impedance at High Frequency	Refer to Maximum Impedance in tabulated standard products table.
Impedance at Low Temperature	Z (−10°C, 100KHz) ≤ 2 times of specified value (+20°C, 100KHz)
Ripple Current	Refer to standard products table.
Ripple Current Correction Factor for Frequency	See table below.
Surge Voltage	See table below.
High Temperature Loading	See table below.

Tangent of Loss Angle

Rated working voltage [V]	6.3	10	16	25	35	40	50	63
tan δ (120Hz, +20°C) ≤	0.22	0.19	0.16	0.14	0.12	0.11	0.10	0.08

For capacitance value > 1 000μF, add 0.02 per another 1 000μF.

Ripple Current Correction Factor for Frequency

Frequency [Hz]		60	120	1K	10K	100K
Correction Factor (multiplier)	6.8-330μF	0.55	0.65	0.85	0.90	1.0
	390-1 000μF	0.70	0.75	0.90	0.95	1.0
	1 200-2 200μF	0.75	0.80	0.90	0.95	1.0
	2 700-15 000μF	0.80	0.85	0.95	1.0	1.0

Surge Voltage

Rated working voltage [V]	6.3	10	16	25	35	40	50	63
Surge Voltage [V]	8	13	20	32	44	50	63	79

High Temperature Loading

Test conditions

Duration	2 000 hours (1 000 hours for $\phi D \leqq 8mm$)
Ambient temperature	+105°C
Applied voltage	DC voltage with maximum permissible ripple current (the sum of the DC voltage and super-imposed peak AC voltage for maximum permissible ripple current should be equal to maximum permissible DC working voltage.)

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>High Temperature Loading (continued)</td><td>Post test requirements at +20℃
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Shelf Life</td><td>Teat conditions
<table>
<tr><td>Duration</td><td>1 000 hours</td></tr>
<tr><td>Ambient temperature</td><td>+105℃</td></tr>
<tr><td>Applied voltage</td><td>(none)</td></tr>
</table>
Post test conditioning by application of voltage at +20℃
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Discharge after application of voltage</td><td>Discharge through a resistor</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements at +20℃ (afrer post test conditioning)
<table>
<tr><td>Leakage current</td><td>≤ Initial specified Value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><td colspan="2">Conditions</td><td>Solvent structure</td><td>Exposure time</td><td>Temperature</td><td>Ultrasonic wave</td></tr>
<tr><td>Solvents</td><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≤ 5 min (total)</td><td>≤ boiling point at 1 atm</td><td>Acceptable</td></tr>
</table></td></tr>
<tr><td>Other Items</td><td>Unless otherwise specified herein. shall conform to Panasonic Specifications and / or JIS-C-5141 where it is applicable.</td></tr>
</table>

PART NUMBER SYSTEM

E C A □ □ F Q □ □ □ □ □

Working Voltage Code			
Code	W. V.	Code	W. V.
0J	6.3V	1V	35V
1A	10V	1G	40V
1C	16V	1H	50V
1E	25V	1J	63V

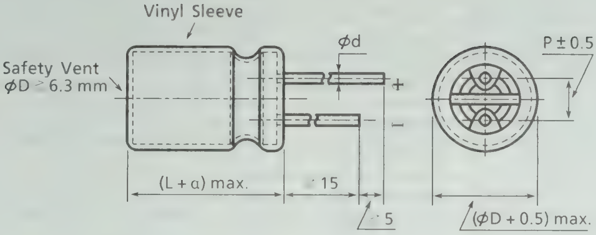
Capacitance Code in μF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Case Size Variation Code if any
Refer to Part Number in tabulated standard products table.

Suffix for Configuration		
Suffix	Configuration	Packaging
(none)	Long lead	Bulk
※B	Taping	Fan fold box

※ Not standard

DIMENSIONS [mm]



α	L
1.0 mm	≤16 mm
2.0 mm	≥20mm

φD	4	5	6.3	8	10	12.5		16	18
L	–	–	–	–	–	≤25	>25	–	–
φd	0.45	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
A	1.5	2	2.5	3.5	5	5	5	7.5	7.5

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
6.3	68	ECA0JFQ680	4×11	120	1.0
	100	ECA0JFQ101	5×11	175	0.65
	150	ECA0JFQ151	5×15	235	0.46
	220	ECA0JFQ221	6.3×11.2	290	0.30
	330	ECA0JFQ331	6.3×15	400	0.20
	470	ECA0JFQ471	8×12.5	445	0.17
	680	ECA0JFQ681L	8×15	575	0.12
		ECA0JFQ681	10×12.5	625	0.12
	820	ECA0JFQ821	10×16	795	0.09
	1 000	ECA0JFQ102	8×20	760	0.09
	1 200	ECA0JFQ122L	10×20	1 015	0.065
		ECA0JFQ122	12.5×15	1 010	0.065
	1 500	ECA0JFQ152	10×25	1 190	0.055
	2 200	ECA0JFQ222L	10×30	1 440	0.045
		ECA0JFQ222	12.5×20	1 400	0.042
	2 700	ECA0JFQ272	12.5×25	1 690	0.034
		ECA0JFQ272S	16×15	1 360	0.046
	3 300	ECA0JFQ332	18×15	1 620	0.038
	3 900	ECA0JFQ392	12.5×30	1 950	0.030
	4 700	ECA0JFQ472L	12.5×35	2 220	0.024
		ECA0JFQ472	16×20	1 730	0.034
	5 600	ECA0JFQ562L	12.5×40	2 390	0.021
		ECA0JFQ562	16×25	2 070	0.028
		ECA0JFQ562S	18×20	2 000	0.028
	6 800	ECA0JFQ682	16×31.5	2 350	0.025
		ECA0JFQ682S	18×25	2 200	0.025
	8 200	ECA0JFQ822	16×35.5	2 550	0.022
	10 000	ECA0JFQ103	18×31.5	2 800	0.023
	12 000	ECA0JFQ123	16×40	2 900	0.018
		ECA0JFQ123S	18×35.5	2 900	0.021
	15 000	ECA0JFQ153	18×40	3 000	0.017

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
10	47	ECA1AFQ470	4 × 11	120	1.0
	82	ECA1AFQ820	5 × 11	175	0.65
	100	ECA1AFQ101	5 × 15	235	0.46
	180	ECA1AFQ181	6.3 × 11.2	290	0.30
	220	ECA1AFQ221	6.3 × 15	400	0.20
	330	ECA1AFQ331	8 × 12.5	445	0.17
	470	ECA1AFQ471L ECA1AFQ471	8 × 15 10 × 12.5	575 625	0.12 0.12
	560	ECA1AFQ561	10 × 16	795	0.09
	680	ECA1AFQ681	8 × 20	760	0.09
	1 000	ECA1AFQ102L ECA1AFQ102	10 × 20 12.5 × 15	1 015 1 010	0.065 0.065
	1 200	ECA1AFQ122	10 × 25	1 190	0.055
	1 500	ECA1AFQ152L	10 × 30	1 440	0.045
	1 800	ECA1AFQ182 ECA1AFQ182S	12.5 × 20 16 × 15	1 400 1 360	0.042 0.046
	2 200	ECA1AFQ222 ECA1AFQ222S	12.5 × 25 18 × 15	1 690 1 620	0.034 0.038
	2 700	ECA1AFQ272	12.5 × 30	1 950	0.030
	3 300	ECA1AFQ332L ECA1AFQ332	12.5 × 35 16 × 20	2 220 1 730	0.024 0.034
	3 900	ECA1AFQ392L ECA1AFQ392 ECA1AFQ392S	12.5 × 40 16 × 25 18 × 20	2 390 2 070 2 000	0.021 0.028 0.028
	5 600	ECA1AFQ562 ECA1AFQ562S	16 × 31.5 18 × 25	2 350 2 200	0.025 0.025
	6 800	ECA1AFQ682L ECA1AFQ682	16 × 35.5 18 × 31.5	2 550 2 800	0.022 0.023
	8 200	ECA1AFQ822L ECA1AFQ822	16 × 40 18 × 35.5	2 900 2 900	0.018 0.021
	10 000	ECA1AFQ103	18 × 40	3 000	0.017
16	39	ECA1CFQ390	4 × 11	120	1.0
	56	ECA1CFQ560	5 × 11	175	0.65
	82	ECA1CFQ820	5 × 15	235	0.46
	120	ECA1CFQ121	6.3 × 11.2	290	0.30
	180	ECA1CFQ181	6.3 × 15	400	0.20
	270	ECA1CFQ271	8 × 12.5	445	0.17
	330	ECA1CFQ331L ECA1CFQ331	8 × 15 10 × 12.5	575 625	0.12 0.12
	390	ECA1CFQ391	10 × 16	795	0.09
	470	ECA1CFQ471	8 × 20	760	0.09
	680	ECA1CFQ681L ECA1CFQ681	10 × 20 12.5 × 15	1 015 1 010	0.065 0.065

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
16	820	ECA1CFQ821	10×25	1 190	0.055
	1 200	ECA1CFQ122L ECA1CFQ122	10×30 12.5×20	1 440 1 400	0.045 0.042
	1 500	ECA1CFQ152 ECA1CFQ152S	12.5×25 16×15	1 690 1 360	0.034 0.046
	1 800	ECA1CFQ182	18×15	1 620	0.038
	2 200	ECA1CFQ222L ECA1CFQ222	12.5×30 16×20	1 950 1 730	0.030 0.034
	2 700	ECA1CFQ272L ECA1CFQ272	12.5×35 16×25	2 220 2 070	0.024 0.028
	3 300	ECA1CFQ332L ECA1CFQ332S	12.5×40 18×20	2 390 2 000	0.021 0.028
	3 900	ECA1CFQ392 ECA1CFQ392S	16×31.5 18×25	2 350 2 200	0.025 0.025
	4 700	ECA1CFQ472L ECA1CFQ472	16×35.5 18×31.5	2 550 2 800	0.022 0.023
	5 600	ECA1CFQ562	16×40	2 900	0.018
	6 800	ECA1CFQ682	18×35.5	2 900	0.021
	8 200	ECA1CFQ822	18×40	3 000	0.017
25	27	ECA1EFQ270	4×11	120	1.0
	39	ECA1EFQ390	5×11	175	0.65
	56	ECA1EFQ560	5×15	235	0.46
	82	ECA1EFQ820	6.3×11.2	290	0.30
	120	ECA1EFQ121	6.3×15	400	0.20
	180	ECA1EFQ181	8×12.5	445	0.17
	220	ECA1EFQ221L ECA1EFQ221	8×15 10×12.5	575 625	0.12 0.12
	270	ECA1EFQ271	10×16	795	0.09
	330	ECA1EFQ331	8×20	760	0.09
	470	ECA1EFQ471L ECA1EFQ471	10×20 12.5×15	1 015 1 010	0.065 0.065
	560	ECA1EFQ561	10×25	1 190	0.055
	820	ECA1EFQ821L ECA1EFQ821 ECA1EFQ821S	10×30 12.5×20 16×15	1 440 1 400 1 360	0.045 0.042 0.046
	1 000	ECA1EFQ102	12.5×25	1 690	0.034
	1 200	ECA1EFQ122	18×15	1 620	0.038
	1 500	ECA1EFQ152L ECA1EFQ152	12.5×30 16×20	1 950 1 730	0.030 0.034
	1 800	ECA1EFQ182L ECA1EFQ182	12.5×35 16×25	2 220 2 070	0.024 0.028

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
25	2 200	ECA1EFQ222L	12.5×40	2 390	0.021
		ECA1EFQ222S	18×20	2 000	0.028
	2 700	ECA1EFQ272	16×31.5	2 350	0.025
		ECA1EFQ272S	18×25	2 200	0.025
	3 300	ECA1EFQ332L	16×35.5	2 550	0.022
		ECA1EFQ332	18×31.5	2 800	0.023
	3 900	ECA1EFQ392L	16×40	2 900	0.018
		ECA1EFQ392	18×35.5	2 900	0.021
	4 700	ECA1EFQ472	18×40	3 000	0.017
35	18	ECA1VFQ180	4×11	120	1.0
	27	ECA1VFQ270	5×11	175	0.65
	39	ECA1VFQ390	5×15	235	0.46
	56	ECA1VFQ560	6.3×11.2	290	0.30
	82	ECA1VFQ820	6.3×15	400	0.20
	120	ECA1VFQ121	8×12.5	445	0.17
	150	ECA1VFQ151L	8×15	575	0.12
		ECA1VFQ151	10×12.5	625	0.12
	180	ECA1VFQ181	10×16	795	0.09
	220	ECA1VFQ221	8×20	760	0.09
	330	ECA1VFQ331L	10×20	1 015	0.065
		ECA1VFQ331	12.5×15	1 010	0.065
	390	ECA1VFQ391	10×25	1 190	0.055
	560	ECA1VFQ561L	10×30	1 440	0.045
		ECA1VFQ561	12.5×20	1 400	0.042
		ECA1VFQ561S	16×15	1 360	0.046
	680	ECA1VFQ681	12.5×25	1 690	0.034
	820	ECA1VFQ821	18×15	1 620	0.038
	1 000	ECA1VFQ102L	12.5×30	1 950	0.030
		ECA1VFQ102	16×20	1 730	0.034
	1 200	ECA1VFQ122L	12.5×35	2 220	0.024
		ECA1VFQ122	16×25	2 070	0.028
	1 500	ECA1VFQ152L	12.5×40	2 390	0.021
		ECA1VFQ152	18×20	2 000	0.028
	1 800	ECA1VFQ182	16×31.5	2 350	0.025
		ECA1VFQ182S	18×25	2 200	0.025
	2 200	ECA1VFQ222L	16×35.5	2 550	0.022
		ECA1VFQ222	18×31.5	2 800	0.023
	2 700	ECA1VFQ272L	16×40	2 900	0.018
		ECA1VFQ272	18×35.5	2 900	0.021
	3 300	ECA1VFQ332	18×40	3 000	0.017

HFQ Series

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
* (40)	12	ECA1GFQ120	4×11	120	1.000
	22	ECA1GFQ220	5×11	175	0.650
	33	ECA1GFQ330	5×15	235	0.460
	39	ECA1GFQ390	6.3×11.2	290	0.300
	68	ECA1GFQ680	6.3×15	400	0.200
	82	ECA1GFQ820	8×12.5	445	0.170
	100	ECA1GFQ101	10×12.5	625	0.120
	120	ECA1GFQ121	8×15	575	0.120
	150	ECA1GFQ151	10×16	795	0.090
	180	ECA1GFQ181	8×20	760	0.090
	270	ECA1GFQ271L ECA1GFQ271	10×20 12.5×15	1 015 1 010	0.065 0.065
	330	ECA1GFQ331	10×25	1 190	0.055
	470	ECA1GFQ471L ECA1GFQ471 ECA1GFQ471S	10×30 12.5×20 16×15	1 440 1 400 1 360	0.045 0.042 0.046
	560	ECA1GFQ561 ECA1GFQ561S	12.5×25 18×15	1 690 1 620	0.034 0.038
	680	ECA1GFQ681	12.5×30	1 950	0.030
	820	ECA1GFQ821L ECA1GFQ821	12.5×35 16×20	2 220 1 730	0.024 0.034
	1 000	ECA1GFQ102L ECA1GFQ102 ECA1GFQ102S	12.5×40 16×25 18×20	2 390 2 070 2 000	0.021 0.028 0.028
	1 200	ECA1GFQ122 ECA1GFQ122S	16×31.5 18×25	2 350 2 200	0.025 0.025
	1 800	ECA1GFQ182	18×31.5	2 800	0.023
	2 200	ECA1GFQ222	18×35.5	2 900	0.021
	2 700	ECA1GFQ272	18×40	3 000	0.017
50	10	ECA1HFQ100	4×11	90	2.500
	18	ECA1HFQ180	5×11	155	1.300
	27	ECA1HFQ270	5×15	215	0.900
	33	ECA1HFQ330	6.3×11.2	260	0.600
	56	ECA1HFQ560	6.3×15	360	0.400
	68	ECA1HFQ680	8×12.5	410	0.300
	82	ECA1HFQ820	10×12.5	510	0.230
	100	ECA1HFQ101	8×15	500	0.230
	120	ECA1HFQ121	10×16	640	0.160
	150	ECA1HFQ151	8×20	670	0.160
	220	ECA1HFQ221L ECA1HFQ221	10×20 12.5×15	890 920	0.110 0.130

※ 40v is not standard.

STANDARD PRODUCTS TABLE

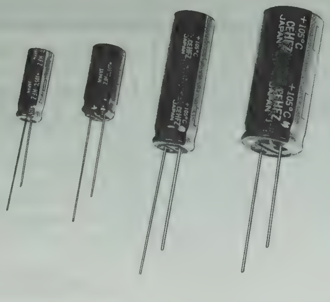
Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions φD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
50	270	ECA1HFQ271	10×25	1 040	0.090
	330	ECA1HFQ331	12.5×20	1 200	0.080
	390	ECA1HFQ391L ECA1HFQ391	10×30 16×15	1 300 1 270	0.075 0.084
	470	ECA1HFQ471 ECA1HFQ471S	12.5×25 18×15	1 440 1 470	0.070 0.070
	560	ECA1HFQ561	12.5×30	1 680	0.060
	680	ECA1HFQ681L ECA1HFQ681 ECA1HFQ681S	12.5×35 16×20 18×20	1 850 1 470 1 810	0.050 0.053 0.050
	820	ECA1HFQ821L ECA1HFQ821	12.5×40 16×25	2 010 1 810	0.043 0.044
	1 000	ECA1HFQ102 ECA1HFQ102S	16×31.5 18×25	2 120 2 000	0.033 0.041
	1 200	ECA1HFQ122L ECA1HFQ122	16×35.5 18×31.5	2 260 2 220	0.028 0.031
	1 500	ECA1HFQ152L ECA1HFQ152	16×40 18×35.5	2 410 2 460	0.026 0.027
	1 800	ECA1HFQ182	18×40	2 560	0.025
63	6.8	ECA1JFQ6R8	4×11	80	3.500
	12	ECA1JFQ120	5×11	145	2.000
	18	ECA1JFQ180	5×15	200	1.300
	22	ECA1JFQ220	6.3×11.2	240	1.000
	39	ECA1JFQ390	6.3×15	330	0.700
	56	ECA1JFQ560	8×12.5	370	0.380
	68	ECA1JFQ680	10×12.5	470	0.300
	82	ECA1JFQ820	8×15	450	0.300
	100	ECA1JFQ101L ECA1JFQ101	8×20 10×16	600 580	0.190 0.190
	150	ECA1JFQ151L ECA1JFQ151	10×20 12.5×15	820 890	0.140 0.160
	180	ECA1JFQ181	10×25	950	0.120
	220	ECA1JFQ221	12.5×20	1140	0.095
	270	ECA1JFQ271L ECA1JFQ271	10×30 16×15	1110 1220	0.095 0.100
	330	ECA1JFQ331 ECA1JFQ331S	12.5×25 18×15	1 420 1 410	0.090 0.085
	390	ECA1JFQ391	12.5×30	1620	0.080

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Dimensions φD×L [mm]	Maximum Permissible Ripple Current (100KHz, +105°C) [mA rms]	Maximum Impedance (100KHz, +20°C) [Ω]
63	470	ECA1JFQ471L ECA1JFQ471	12.5×35 16×20	1 780 1 450	0.065 0.070
	560	ECA1JFQ561L ECA1JFQ561 ECA1JFQ561S	12.5×40 16×25 18×20	1 950 1 750 1 750	0.060 0.060 0.065
	680	ECA1JFQ681 ECA1JFQ681S	16×31.5 18×25	2 050 1 940	0.050 0.057
	820	ECA1JFQ821	16×35.5	2 220	0.042
	1 000	ECA1JFQ102L ECA1JFQ102	16×40 18×31.5	2 370 2 110	0.034 0.048
	1 200	ECA1JFQ122	18×35.5	2 300	0.041
	1 500	ECA1JFQ152	18×40	2 510	0.033

HFZ Series

FEATURES



- Long Life : 5000 hours at +105°C
  (Expected Life : 13 years at +60°C)
- Low Impedance at High Frequency & Low Temperature
- Wide Range of Operating Temperature from −55°C to +105
- Anti-solvent : Freon-TE, TES, TP35 or equivalents

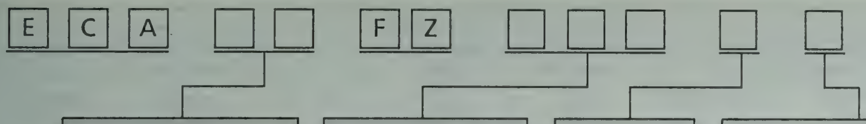
SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="9">Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td colspan="9">−55°C to +105°C</td></tr>
<tr><td>Rated Working Voltage Range</td><td colspan="9">6.3V to 63V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td colspan="9">22 to 5 600μF (120Hz, +20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="9">±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td colspan="9">I ≦ 0.01CV or 3 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C. (C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td rowspan="3">Tangent of Loss Angle</td><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>40</td><td>50</td><td>63</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≤</td><td>0.17</td><td>0.15</td><td>0.10</td><td>0.08</td><td>0.07</td><td>0.07</td><td>0.06</td><td>0.05</td></tr>
<tr><td colspan="9">For capacitance > 1 000μF, add 0.02 per another 1 000μF</td></tr>
<tr><td>Impedance at High Frequency</td><td colspan="9">Refer to tabulated maximum impedance values in the standard products table.</td></tr>
<tr><td>Impedance at Low Temperature</td><td colspan="9">Z (100KHz, −10°C) ≤ 2 times of the specified value (100KHz, +20°C)</td></tr>
<tr><td>Ripple Current</td><td colspan="9">Refer to standard products table.</td></tr>
<tr><td rowspan="5">Ripple Current Correction Factor for Frequency</td><td colspan="2">Frequency [Hz]</td><td>60</td><td>120</td><td>1K</td><td>10K</td><td>100K</td><td colspan="2"></td></tr>
<tr><td rowspan="4">Correction Factor (Multiplier)</td><td>22-330μF</td><td>0.55</td><td>0.65</td><td>0.85</td><td>0.90</td><td>1.0</td><td colspan="2"></td></tr>
<tr><td>390-1 000μF</td><td>0.70</td><td>0.75</td><td>0.90</td><td>0.95</td><td>1.0</td><td colspan="2"></td></tr>
<tr><td>1 200-2 200μF</td><td>0.75</td><td>0.80</td><td>0.90</td><td>0.95</td><td>1.0</td><td colspan="2"></td></tr>
<tr><td>2 700-5 600μF</td><td>0.80</td><td>0.85</td><td>0.95</td><td>1.0</td><td>1.0</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Surge Voltage</td><td>Rated working voltage [V]</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>40</td><td>50</td><td>63</td></tr>
<tr><td>Surge Voltage [V]</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>50</td><td>63</td><td>79</td></tr>
<tr><td rowspan="4">High Temperature Loading</td><td colspan="9">Test conditions</td></tr>
<tr><td>Duration</td><td colspan="8">5 000 hours</td></tr>
<tr><td>Ambient temperature</td><td colspan="8">+105°C</td></tr>
<tr><td>Applied voltage</td><td colspan="8">DC voltage with rated ripple current (the sum of the DC voltage and super-imposed peak AC voltage for rated ripple current should be equal to rated DC working voltage)</td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>High Temperature Loading (continued)</td><td>Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ Initial specified Value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 200% of initial specified value</td></tr>
<tr><td>Impedance</td><td>≦ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Shelf Life</td><td>Post test requirements at +20°C
<table>
<tr><td>Duration</td><td>1 000 hours</td></tr>
<tr><td>Ambient temperature</td><td>+105°C</td></tr>
<tr><td>Applied voltage</td><td>(none)</td></tr>
</table>
Post test conditioning by application of voltage at +20°C
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Discharge</td><td>Through a resistor after application of voltage</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements at +20°C (after post test conditioning)
<table>
<tr><td>Leakage current</td><td>≦ Initial specified Value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±15% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ 150% of initial specified value</td></tr>
<tr><td>Impedance</td><td>≦ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><th>Conditions
Solvents</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≦ 5 min (total)</td><td>≦ Boiling point at 1 atm</td><td>Acceptable</td></tr>
</table></td></tr>
<tr><td>Other Items</td><td>Unless otherwise specified herein, conform to Panasonic Specifications and/or JIS-C-5141 where it is applicable.</td></tr>
</table>

PART NUMBER SYSTEM



Working Voltage Code			
Code	W. V.	Code	W. V.
0J	6.3V	1V	35V
1A	10V	1G	40V
1C	16V	1H	50V
1E	25V	1J	63V

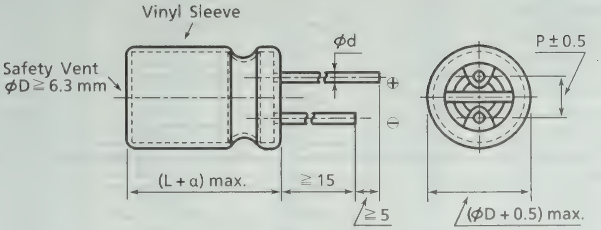
Capacitance Code in μF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Case Size Variation Code if any
Refer to Part Number in tabulated standard products table.

Suffix for Configuration		
Suffix	Configuration	Packaging
(none)	Long lead	Bulk
※B	Taping	Fan fold box

※ Not standard

DIMENSIONS [mm]



α	L
1.0 mm	≦ 16 mm
2.0 mm	≧ 20mm

ϕD	8	10	12.5		16	18
L	–	–	≦ 25	> 25	–	–
ϕd	0.6	0.6	0.6	0.8	0.8	0.8
A	3.5	5	5	5	7.5	7.5

HFZ Series

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz (+20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100kHz) (+105°C) [mA rms]	Maximum Impedance		
					(100kHz) (+20°C) [Ω]	(300kHz) (+20°C) [Ω]	(500kHz) (+20°C) [Ω]
6.3	330	ECA0JFZ331	8×15	575	0.120	0.132	0.144
	390	ECA0JFZ391	10×16	795	0.090	0.099	0.108
	470	ECA0JFZ471	8×20	760	0.090	0.099	0109
	560	ECA0JFZ561	10×20	1 015	0.065	0.072	0.078
	820	ECA0JFZ821	10×25	1 190	0.055	0.066	0.071
	1 000	ECA0JFZ102	12.5×20	1 400	0.042	0.055	0.063
	1 200	ECA0JFZ122L ECA0JFZ122	10×30 12.5×25	1 440 1 690	0.045 0.034	0.054 0.044	0.058 0.051
	1 500	ECA0JFZ152	12.5×30	1 950	0.030	0.039	0.045
	1 800	ECA0JFZ182	16×20	1 690	0.034	0.051	0.061
	2 200	ECA0JFZ222L ECA0JFZ222 ECA0JFZ222S	12.5×35 16×25 18×20	2 220 2 010 2 010	0.024 0.028 0.028	0.031 0.042 0.045	0.036 0.050 0.062
	2 700	ECA0JFZ272L ECA0JFZ272	12.5×40 18×25	2 390 2 200	0.021 0.025	0.027 0.040	0.032 0.055
	3 300	ECA0JFZ332	16×31.5	2 350	0.025	0.038	0.045
	3 900	ECA0JFZ392L ECA0JFZ392	16×35.5 18×31.5	2 550 2 800	0.022 0.023	0.033 0.037	0.040 0.051
	4 700	ECA0JFZ472L ECA0JFZ472	16×40 18×35.5	2 900 2 900	0.018 0.021	0.027 0.034	0.032 0.046
	5 600	ECA0JFZ562	18×40	3 000	0.017	0.027	0.037
10	220	ECA1AFZ221	8×15	575	0.120	0.132	0.144
	330	ECA1AFZ331	10×16	795	0.090	0.099	0.108
	390	ECA1AFZ391	8×20	760	0.090	0.099	0.108
	470	ECA1AFZ471	10×20	1 015	0.065	0.072	0.078
	680	ECA1AFZ681	10×25	1 190	0.055	0.066	0.071
	820	ECA1AFZ821	12.5×20	1 400	0.042	0.055	0.063
	1 000	ECA1AFZ102L ECA1AFZ102	10×30 12.5×25	1 440 1 690	0.045 0.034	0.054 0.044	0.058 0.051
	1 200	ECA1AFZ122L ECA1AFZ122	12.5×30 16×20	1 950 1 690	0.030 0.034	0.039 0.051	0.045 0.061
	1 800	ECA1AFZ182L ECA1AFZ182 ECA1AFZ182S	12.5×35 16×25 18×20	2 220 2 010 2 010	0.024 0.028 0.028	0.031 0.042 0.045	0.036 0.050 0.062
	2 200	ECA1AFZ222L ECA1AFZ222 ECA1AFZ222S	12.5×40 16×31.5 18×25	2 390 2 350 2 200	0.021 0.025 0.025	0.027 0.038 0.040	0.032 0.045 0.055
	2 700	ECA1AFZ272	16×35.5	2 550	0.022	0.033	0.040
	3 300	ECA1AFZ332L ECA1AFZ332	16×40 18×31.5	2 900 2 800	0.018 0.023	0.027 0.037	0.032 0.051
	3 900	ECA1AFZ392	18×35.5	2 900	0.021	0.034	0.046
	4 700	ECA1AFZ472	18×40	3 000	0.017	0.027	0.037

STASNDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz (+20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100kHz) (+105°C) [mA rms]	Maximum Impedance		
					(100kHz) (+20°C) [Ω]	(300kHz) (+20°C) [Ω]	(500kHz) (+20°C) [Ω]
16	150	ECA1CFZ151	8×15	575	0.120	0.132	0.144
	220	ECA1CFZ221L	8×20	760	0.090	0.099	0.108
		ECA1CFZ221	10×16	795	0.090	0.099	0.108
	330	ECA1CFZ331	10×20	1 015	0.065	0.072	0.078
	390	ECA1CFZ391	10×25	1 190	0.055	0.066	0.071
	470	ECA1CFZ471	12.5×20	1 400	0.042	0.055	0.063
	560	ECA1CFZ561	10×30	1 440	0.045	0.054	0.058
	680	ECA1CFZ681	12.5×25	1 690	0.034	0.044	0.051
	820	ECA1CFZ821L	12.5×30	1 950	0.030	0.039	0.045
		ECA1CFZ821	16×20	1 690	0.034	0.051	0.061
	1 000	ECA1CFZ102L	12.5×35	2 220	0.024	0.031	0.036
		ECA1CFZ102	16×25	2 010	0.028	0.042	0.050
	1 200	ECA1CFZ122L	12.5×40	2 390	0.021	0.027	0.032
		ECA1CFZ122	18×20	2 010	0.028	0.045	0.062
	1 500	ECA1CFZ152	16×31.5	2 350	0.025	0.038	0.045
		ECA1CFZ152S	18×25	2 200	0.025	0.040	0.055
	1 800	ECA1CFZ182L	16×35.5	2 550	0.022	0.033	0.040
		ECA1CFZ182	18×31.5	2 800	0.023	0.037	0.051
	2 200	ECA1CFZ222L	16×40	2 900	0.018	0.027	0.032
		ECA1CFZ222	18×35.5	2 900	0.021	0.034	0.046
	2 700	ECA1CFZ272	18×40	3 000	0.017	0.027	0.037
25	82	ECA1EFZ820	8×15	575	0.120	0.132	0.144
	120	ECA1EFZ121L	8×20	760	0.090	0.099	0.108
		ECA1EFZ121	10×16	795	0.090	0.099	0.108
	180	ECA1EFZ181	10×20	1 015	0.065	0.072	0.078
	220	ECA1EFZ221	10×25	1 190	0.055	0.066	0.071
	270	ECA1EFZ271	12.5×20	1 400	0.042	0.055	0.063
	330	ECA1EFZ331L	10×30	1 440	0.045	0.054	0.058
		ECA1EFZ331	12.5×25	1 690	0.034	0.044	0.051
	470	ECA1EFZ471L	12.5×30	1 950	0.030	0.039	0.045
		ECA1EFZ471	16×20	1 690	0.034	0.051	0.061
	560	ECA1EFZ561L	12.5×35	2 220	0.024	0.031	0.036
		ECA1EFZ561	16×25	2 010	0.028	0.042	0.050
		ECA1EFZ561S	18×20	2 010	0.028	0.045	0.062
	680	ECA1EFZ681L	12.5×40	2 390	0.021	0.027	0.032
		ECA1EFZ681	18×25	2 200	0.025	0.040	0.055
	820	ECA1EFZ821	16×31.5	2 350	0.025	0.038	0.045
	1 000	ECA1EFZ102L	16×35.5	2 550	0.022	0.033	0.040
		ECA1EFZ102	18×31.5	2 800	0.023	0.037	0.051
	1 200	ECA1EFZ122L	16×40	2 900	0.018	0.027	0.032
		ECA1EFZ122	18×35.5	2 900	0.021	0.034	0.046
	1 500	ECA1EFZ152	18×40	3 000	0.017	0.027	0.037

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz) (+20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100kHz) (+105°C) [mA rms]	Maximum Impedance		
					(100kHz) (+20°C) [Ω]	(300kHz) (+20°C) [Ω]	(500kHz) (+20°C) [Ω]
35	56	ECA1VFZ560	8×15	575	0.120	0.132	0.144
	82	ECA1VFZ820L ECA1VFZ820	8×20 10×16	760 795	0.090 0.090	0.099 0.099	0.108 0.108
	120	ECA1VFZ121	10×20	1 015	0.065	0.072	0.078
	150	ECA1VFZ151	10×25	1 190	0.055	0.066	0.071
	180	ECA1VFZ181	12.5×20	1 400	0.042	0.055	0.063
	220	ECA1VFZ221L ECA1VFZ221	10×30 12.5×25	1 440 1 690	0.045 0.034	0.054 0.044	0.058 0.051
	330	ECA1VFZ331L ECA1VFZ331	12.5×30 16×20	1 950 1 690	0.030 0.034	0.039 0.051	0.045 0.061
	390	ECA1VFZ391L ECA1VFZ391	12.5×35 16×25	2 220 2 010	0.024 0.028	0.031 0.042	0.036 0.050
	470	ECA1VFZ471L ECA1VFZ471	12.5×40 18×20	2 390 2 010	0.021 0.028	0.027 0.045	0.032 0.062
	560	ECA1VFZ561 ECA1VFZ561S	16×31.5 18×25	2 350 2 200	0.025 0.025	0.038 0.040	0.045 0.055
	680	ECA1VFZ681	16×35.5	2 550	0.022	0.033	0.040
	820	ECA1VFZ821L ECA1VFZ821	16×40 18×31.5	2 900 2 800	0.018 0.023	0.027 0.037	0.032 0.051
	1 000	ECA1VFZ102	18×35.5	2 900	0.021	0.034	0.046
	1 200	ECA1VFZ122	18×40	3 000	0.017	0.027	0.037
* (40)	47	ECA1GFZ470	8×15	575	0.120	0.132	0.144
	68	ECA1GFZ680L ECA1GFZ680	8×20 10×16	760 795	0.090 0.090	0.099 0.099	0.108 0.108
	100	ECA1GFZ101	10×20	1 015	0.065	0.072	0.078
	120	ECA1GFZ121	10×25	1 190	0.055	0.066	0.071
	150	ECA1GFZ151	12.5×20	1 400	0.042	0.055	0.063
	180	ECA1GFZ181L ECA1GFZ181	10×30 12.5×25	1 440 1 690	0.045 0.034	0.054 0.044	0.058 0.051
	270	ECA1GFZ271L ECA1GFZ271	12.5×30 16×20	1 950 1 690	0.030 0.034	0.039 0.051	0.045 0.061
	330	ECA1GFZ331L ECA1GFZ331 ECA1GFZ331S	12.5×35 16×25 18×20	2 220 2 010 2 010	0.024 0.028 0.028	0.031 0.042 0.045	0.036 0.050 0.062
	390	ECA1GFZ391L ECA1GFZ391	12.5×40 18×25	2 390 2 200	0.021 0.025	0.027 0.040	0.032 0.055
	470	ECA1GFZ471	16×31.5	2 350	0.025	0.038	0.045
	560	ECA1GFZ561L ECA1GFZ561	16×35.5 18×31.5	2 550 2 800	0.022 0.023	0.033 0.037	0.040 0.051
	680	ECA1GFZ681L ECA1GFZ681	16×40 18×35.5	2 900 2 900	0.018 0.021	0.027 0.034	0.032 0.046
	820	ECA1GFZ821	18×40	3 000	0.017	0.027	0.037

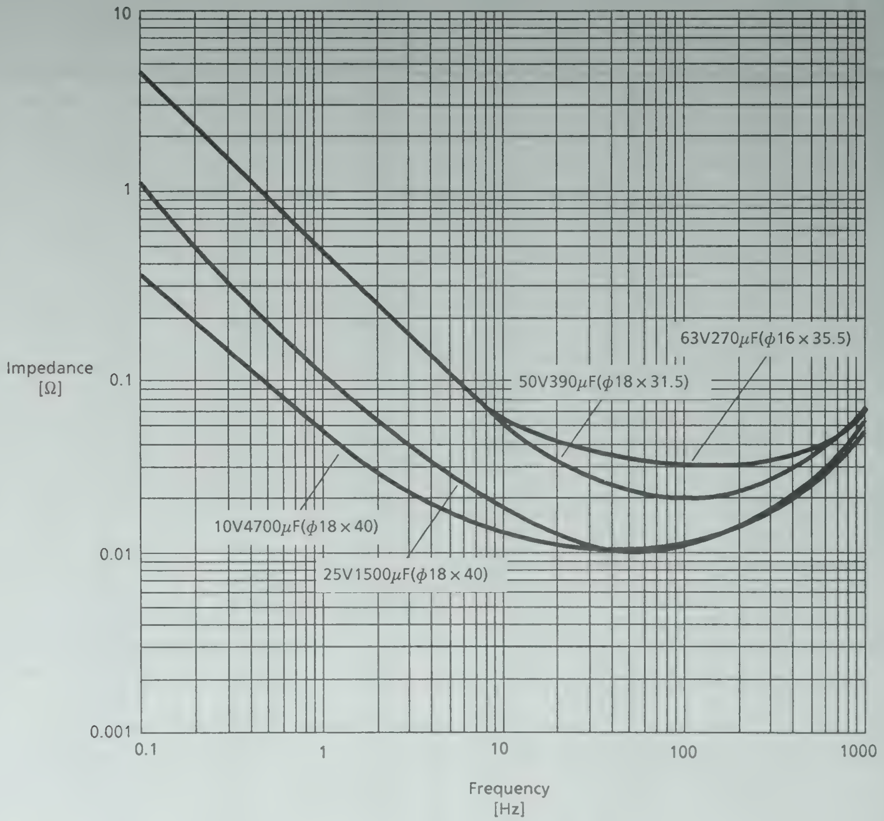
*: 40v is not standard.

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz (+20°C) [μF]	Part Number	Dimensions ϕD×L [mm]	Maximum Permissible Ripple Current (100kHz) (+105°C) [mA rms]	Maximum Impedance		
					(100kHz) (+20°C) [Ω]	(300kHz) (+20°C) [Ω]	(500kHz) (+20°C) [Ω]
50	33	ECA1HFZ330	8×15	500	0.230	0.253	0.276
	39	ECA1HFZ390	10×16	640	0.160	0.176	0.192
	47	ECA1HFZ470	8×20	670	0.160	0.176	0.192
	68	ECA1HFZ680	10×20	890	0.110	0.121	0.132
	82	ECA1HFZ820	10×25	1 040	0.090	0.099	0.108
	100	ECA1HFZ101	12.5×20	1 200	0.080	0.104	0.120
	120	ECA1HFZ121L	10×30	1 300	0.075	0.083	0.090
		ECA1HFZ121	12.5×25	1 440	0.070	0.091	0.105
	180	ECA1HFZ181L	12.5×30	1 680	0.060	0.078	0.090
		ECA1HFZ181	16×20	1 470	0.053	0.080	0.095
	220	ECA1HFZ221L	12.5×35	1 850	0.050	0.065	0.075
		ECA1HFZ221	16×25	1 810	0.044	0.066	0.079
		ECA1HFZ221S	18×20	1 810	0.050	0.080	0.110
	270	ECA1HFZ271L	12.5×40	2 010	0.043	0.056	0.065
		ECA1HFZ271	18×25	2 000	0.041	0.066	0.090
	330	ECA1HFZ331	16×31.5	2 120	0.033	0.050	0.059
	390	ECA1HFZ391L	16×35.5	2 260	0.028	0.042	0.050
		ECA1HFZ391	18×31.5	2 220	0.031	0.050	0.068
	470	ECA1HFZ471L	16×40	2 410	0.026	0.039	0.047
		ECA1HFZ471	18×35.5	2 460	0.027	0.043	0.059
	560	ECA1HFZ561	18×40	2 560	0.025	0.040	0.055
63	22	ECA1JFZ220	8×15	450	0.300	0.330	0.360
	33	ECA1JFZ330L	8×20	600	0.190	0.209	0.228
		ECA1JFZ330	10×16	580	0.190	0.209	0.228
	47	ECA1JFZ470	10×20	820	0.140	0.154	0.168
	56	ECA1JFZ560	10×25	950	0.120	0.132	0.144
	82	ECA1JFZ820L	10×30	1110	0.095	0.105	0.114
		ECA1JFZ820	12.5×20	1140	0.095	0.123	0.143
	100	ECA1JFZ101	12.5×25	1420	0.090	0.117	0.135
	120	ECA1JFZ121	12.5×30	1620	0.080	0.104	0.120
	150	ECA1JFZ151L	12.5×35	1780	0.065	0.085	0.093
		ECA1JFZ151	16×20	1450	0.070	0.105	0.126
	180	ECA1JFZ181L	12.5×40	1950	0.060	0.078	0.090
		ECA1JFZ181	16×25	1750	0.060	0.090	0.108
		ECA1JFZ181S	18×20	1750	0.065	0.104	0.143
	220	ECA1JFZ221L	16×31.5	2050	0.050	0.075	0.090
		ECA1JFZ221	18×25	1940	0.057	0.091	0.125
	270	ECA1JFZ271	16×35.5	2220	0.042	0.063	0.076
	330	ECA1JFZ331L	16×40	2370	0.034	0.051	0.061
		ECA1JFZ331	18×31.5	2110	0.048	0.077	0.106
	390	ECA1JFZ391	18×35.5	2300	0.041	0.066	0.090
	470	ECA1JFZ471	18×40	2510	0.033	0.053	0.073

ELECTRICAL CHARACTERISTICS

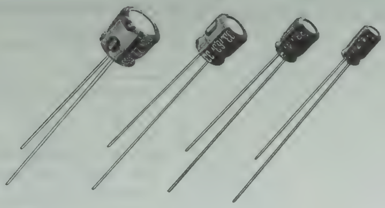
■Typical Impedance vs Frequency



KA/KS Series

Radial Leads Type

FEATURES



- **Life : 1000 hours at +85°C**
- **Operating Temperature : −40°C to +85°C**
- **Low Profile, Miniaturized :**
  KA Series ; 7 mm height version
  KS Series ; 5 mm height version
- **Anti-solvent : Freon-TE, TES, TP35 for KA Series**

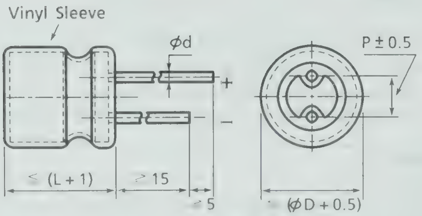
SPECIFICATIONS

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Rated Working Voltage Range</td><td>4V to 50V DC</td></tr>
<tr><td>Operating Temperature Range</td><td>−40°C to +85°C</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td>I ≦ 0.01CV or 3 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C (C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td>
<table>
<tr><td>Rated working voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr>
<tr><td>tan δ (120Hz, +20°C) : ≤</td><td>0.35</td><td>0.24</td><td>0.20</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.10</td></tr>
</table>
</td></tr>
<tr><td>Surge Voltage</td><td>
<table>
<tr><td>Rated working voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr>
<tr><td>Surge voltage [V]</td><td>5</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td></tr>
</table>
</td></tr>
<tr><td>Characteristics at Low Temperature</td><td>
<table>
<tr><td colspan="2">Rated working voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr>
<tr><td rowspan="2">Impedance Ratio (120Hz) : ≤</td><td>−25°C / +20°C</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>−40°C / +20°C</td><td>15</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr>
</table>
</td></tr>
<tr><td>Ripple Current</td><td>Refer to tabulated standard products table</td></tr>
<tr><td>Ripple Current Correction Factor for Frequency</td><td>Correction factor (multiplier)
<table>
<tr><td>Frequency [Hz]</td><td>60</td><td>120</td><td>1k</td><td>10k</td></tr>
<tr><td>Correction factor (multiplier)</td><td>0.7</td><td>1</td><td>1.30</td><td>1.70</td></tr>
</table>
</td></tr>
<tr><td>High Temperature Loading</td><td>Test conditions
<table>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>Rated DC working voltage</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 200% of initial specified value</td></tr>
</table>
</td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Shelf Life</td><td>
Test conditions
<table>
<tr><td>Duration</td><td>1000h</td></tr>
<tr><td>Ambient temperature</td><td>+85°C ±2°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td></tr>
</table>
Post test conditioning by application of voltage
<table>
<tr><td>Applied voltage</td><td>Rated working voltage</td></tr>
<tr><td>Duration</td><td>30min</td></tr>
<tr><td>Ambient temperature</td><td>+20°C</td></tr>
<tr><td>Discharge</td><td>Through a resistor after application of voltage</td></tr>
<tr><td>Stabilization time</td><td>24h to 48h after discharge</td></tr>
</table>
Post test requirements at +20°C (after post test conditioning)
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≤ ±20% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≤ 200% of initial specified value</td></tr>
</table>
</td></tr>
<tr><td>Cleaning</td><td>
Capacitors (KA Series only) shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><th>Conditions
Solvents</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≤ 5 min (total)</td><td>≤ boiling point at 1 atm</td><td>Acceptable</td></tr>
</table>
</td></tr>
<tr><td>Other items</td><td>Unless otherwise specified herein, conform to Panasonic Specifications and/or JIS-C-5141 where it is applicable.</td></tr>
</table>

DIMENSIONS



φD	3	4	5	6.3	8
φd	0.4	0.45	0.45	0.45	0.45
P	1.0	1.5	2.0	2.5	*3.5/2.5

※ P = 2.5 for KS Series
P = 3.5 for KA Series

PART NUMBER SYSTEM

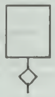
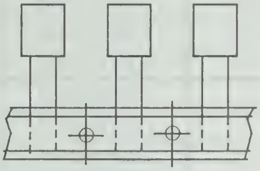
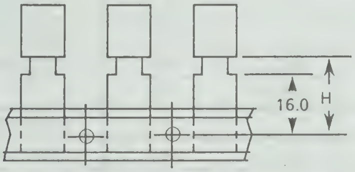
E C E A ☐☐ ☐☐ ☐☐☐ ☐

Working Voltage Code	
Code	W. V.
0G	4V
0J	6.3V
1A	10V
1C	16V
1E	25V
1V	35V
1H	50V

Series Code	
Code	Series
KA	KA Series
KS	KS Series
KK	KS Series ϕD = 3

Capacitance Code in μF	
First two digits	Significant figures (where necessary. zero is preceded)
Third digit	Number of zeros to follow
"R" in three-digit block	Decimal point (where necessary, "R" is used as a decimal point. In this case, other two figures are significant.

※ Not standard

<table>
<tr><th colspan="3">Suffix for Configuration</th></tr>
<tr><th>Suffix</th><th>Configuration</th><th>Packaging</th></tr>
<tr><td>(none)</td><td>Long lead</td><td>Bulk</td></tr>
<tr><td>※E</td><td>Snap-in lead
<table><tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr><tr><td>5mm</td><td>ϕD : 4 - 8</td></tr></table></td><td>Bulk</td></tr>
<tr><td>※I</td><td>Taping
<table><tr><th>Lead spacing</th><th>Case diameter [mm]</th></tr><tr><td>2.5mm</td><td>ϕD : 5 - 8</td></tr></table></td><td>Fan fold box<table><tr><th>ϕD</th><th>Pcs/box</th></tr><tr><td>5 - 6.3</td><td>2 000</td></tr><tr><td>8</td><td>1 000</td></tr></table></td></tr>
<tr><td>※B</td><td rowspan="2">Taping
 <table><tr><th>Suffix</th><th>Lead spacing</th><th>Dim. H</th><th>Case size [mm]</th></tr><tr><td>B</td><td>5mm</td><td>17.5mm</td><td>ϕD3 - 6.3 × 5 - 7</td></tr><tr><td>Q</td><td>5mm</td><td>18.5mm</td><td>ϕD 8 × 5 - 7</td></tr></table></td><td rowspan="2">Fan fold box<table><tr><th>ϕD</th><th>Pcs/box</th></tr><tr><td>5 - 6.3</td><td>2 000</td></tr><tr><td>8</td><td>1 000</td></tr></table></td></tr>
<tr><td>※Q</td></tr>
</table>

STANDARD PRODUCTS TABLE

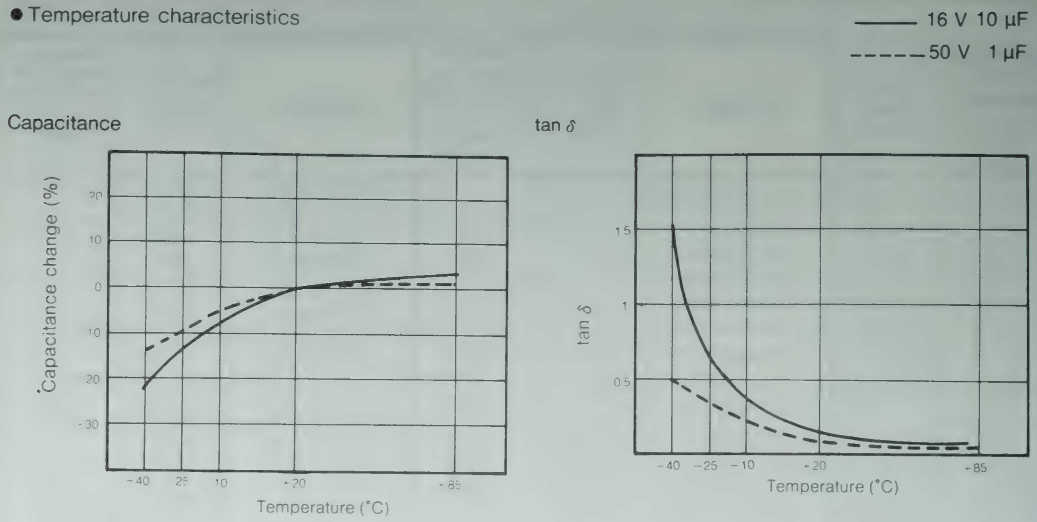
Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	KA Series			KS Series		
		Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +85°C) [mA rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +85°C) [A rms]
4	22	–	–	–	ECEA0GKK220	3×5	19.0
	33	ECEA0GKA330	4×7	25.0	ECEA0GKS330	4×5	26.0
	47	ECEA0GKA470	4×7	34.0	ECEA0GKS470	4×5	34.0
	100	ECEA0GKA101	5×7	61.0	ECEA0GKS101	5×5	61.0
	220	ECEA0GKA221	6.3×7	82.0	ECEA0GKS221	6.3×5	82.0
	330	ECEA0GKA331	8×7	110.0	–	–	–
	470	ECEA0GKA471	8×7	140.0	–	–	–
6.3	22	ECEA0JKA220	4×7	29.0	ECEA0JKS220	4×5	29.0
	33	ECEA0JKA330	4×7	38.0	ECEA0JKS330	5×5	38.0
	47	ECEA0JKA470	4×7	46.0	ECEA0JKS470	5×5	46.0
	100	ECEA0JKA101	5×7	71.0	ECEA0JKS101	6.3×5	71.0
	220	ECEA0JKA221	6.3×7	103.0	–	–	–
	330	ECEA0JKA331	8×7	130.0	ECEA0JKS331	8×5	130.0
10	22	ECEA1AKA220	4×7	35.0	ECEA1AKS220	5×5	35.0
	33	ECEA1AKA330	4×7	43.0	ECEA1AKS330	5×5	43.0
	47	ECEA1AKA470	5×7	65.0	ECEA1AKS470	6.3×5	65.0
	100	ECEA1AKA101	6.3×7	80.0	ECEA1AKS101	6.3×5	80.0
	220	ECEA1AKA221	8×7	120.0	ECEA1AKS221	8×5	120.0
16	10	ECEA1CKA100	4×7	28.0	ECEA1CKS100 ECEA1CKK100	4×5 3×5	28.0
	22	ECEA1CKA220	4×7	39.0	ECEA1CKS220	5×5	39.0
	33	ECEA1CKA330	5×7	60.0	ECEA1CKS330	6.3×5	60.0
	47	ECEA1CKA470	5×7	70.0	ECEA1CKS470	6.3×5	70.0
	100	ECEA1CKA101	6.3×7	91.0	ECEA1CKS101	8×5	91.0
25	2.2	–	–	–	ECEA1EKK2R2	3×5	8.0
	3.3	–	–	–	ECEA1EKK3R3	3×5	10.0
	4.7	ECEA1EKA4R7	4×7	21.0	ECEA1EKS4R7 ECEA1EKK4R7	4×5 3×5	22.0 12.0
	10	ECEA1EKA100	4×7	28.0	ECEA1EKS100	5×5	28.0
	22	ECEA1EKA220	5×7	55.0	ECEA1EKS220	6.3×5	55.0
	33	ECEA1EKA330	6.3×7	65.0	ECEA1EKS330	6.3×5	65.0
	47	ECEA1EKA470	6.3×7	70.	–	–	–
35	3.3	–	–	–	ECEA1VKS3R3	4×5	16.0
	4.7	ECEA1VKA4R7	4×7	22.0	ECEA1VKS4R7	4×5	22.0
	10	ECEA1VKA100	5×7	30.0	ECEA1VKS100	5×5	30.0
	22	ECEA1VKA220	6.3×7	60.0	ECEA1VKS220	6.3×5	60.0
	33	ECEA1VKA330	6.3×7	65.0	ECEA1VKS330	8×5	65.0
	47	ECEA1VKA470	8×7	85.0	ECEA1VKS470	8×5	85.0

STANDARD PRODUCTS TABLE

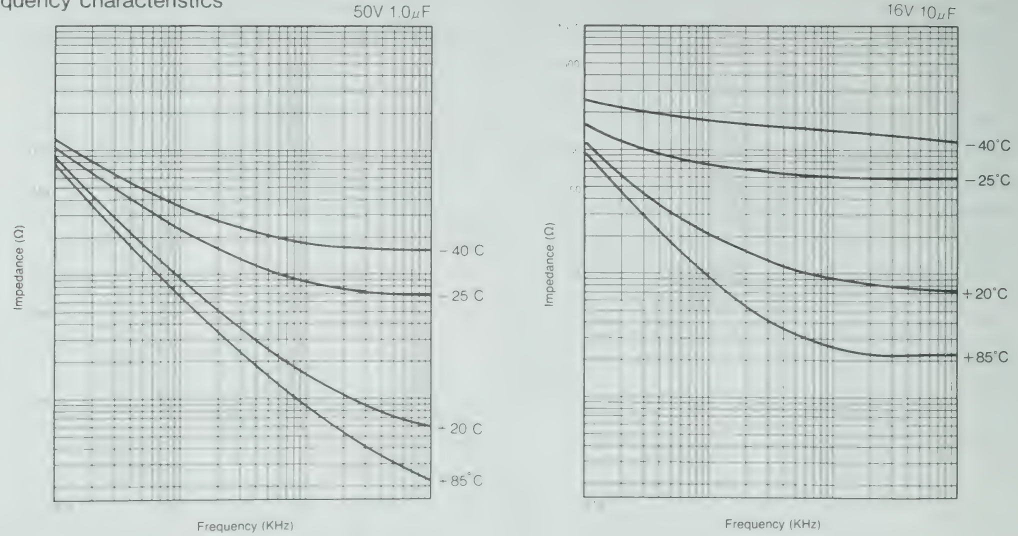
Rated Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	KA Series			KS Series		
		Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +85°C) [mA rms]	Part Number	Dimensions ϕD × L [mm]	Maximum Permissible ripple current (120Hz, +85°C) [A rms]
50	0.1	ECEA1HKA0R1	4×7	1.0	ECEA1HKS0R1 ECEA1HKK0R1	4×5 3×5	1.0 1.0
	0.22	ECEA1HKAR22	4×7	2.0	ECEA1HKSR22 ECEA1HKKR22	4×5 3×5	2.0 2.0
	0.33	ECEA1HKAR33	4×7	3.0	ECEA1HKSR33 ECEA1HKKR33	4×5 3×5	3.0 3.0
	0.47	ECEA1HKAR47	4×7	5.0	ECEA1HKSR47 ECEA1HKKR47	4×5 3×5	5.0 5.0
	1	ECEA1HKA010	4×7	10.0	ECEA1HKS010 ECEA1HKK010	4×5 3×5	10.0 8.0
	2.2	ECEA1HKA2R2	4×7	16.0	ECEA1HKS2R2	4×5	16.0
	3.3	ECEA1HKA3R3	4×7	18.0	ECEA1HKS3R3	4×5	16.0
	4.7	ECEA1HKA4R7	4×7	23.0	ECEA1HKS4R7	5×5	23.0
	10	ECEA1HKA100	5×7	35.0	ECEA1HKS100	6.3×5	35.0
	22	ECEA1HKA220	6.3×7	60.0	ECEA1HKS220	8×5	60.0
	33	ECEA1HKA330	8×7	75.0	–	–	–

CHARACTERISTICS (KS Series)

- Temperature characteristics



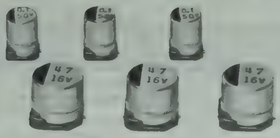
- Frequency characteristics

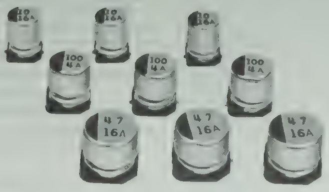


VV/VA Series
Surface Mount Type

FEATURES

- Surface Mount Type
- High CV Volumetric Efficiency for Mounting Area
- Tape and Reel Packaging for Automatic Placement
- Anti-solvent : Freon-TE, TES, TP-35





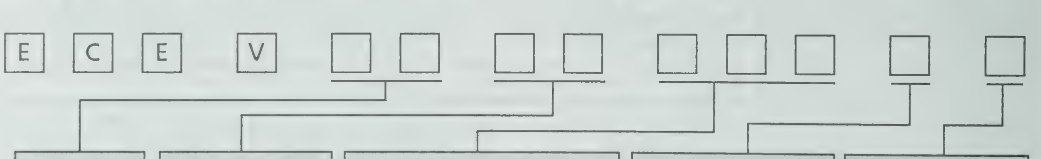
SPECIFICATIONS

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td><table><tr><td>VV Series</td><td>−40°C to +105°C</td></tr><tr><td>VA Series</td><td>−40°C to +85°C</td></tr></table></td></tr>
<tr><td>Rated Working Voltage Range</td><td>4V to 50V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td>0.1μF to 220μF (120Hz, +20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% (120Hz, +20°C)</td></tr>
<tr><td>Leakage Current</td><td>I ≦ 0.01C·V or 3 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C (C = nominal capacitance in micro-farads, V = rated working voltage in volts).</td></tr>
<tr><td>Tangent of Loss Angle</td><td><table><tr><td>Rated working voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>tan δ (120Hz, +20°C) : ≦</td><td>0.35</td><td>0.26</td><td>0.20</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.12</td></tr></table></td></tr>
<tr><td>Characteristics at Low Temperature</td><td><table><tr><td colspan="2">Rated working voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td rowspan="2">Impedance ratio (120Hz) : ≦</td><td>-25°C / +20°C</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>-40°C / +20°C</td><td>15</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table></td></tr>
<tr><td>High Temperature Loading</td><td>Test conditions<table><tr><td>Series
Item</td><td>VV</td><td>VA</td></tr><tr><td>Duration</td><td>2 000h</td><td>1 000h</td></tr><tr><td>Applied voltage</td><td>Rated working voltage</td><td>Rated working voltage</td></tr><tr><td>Ambient temperature</td><td>+105°C</td><td>+85°C</td></tr></table>Post test requirements at +20°C<table><tr><td>Series
Item</td><td>VV</td><td>VA</td></tr><tr><td>Leakage current</td><td>≦ Initial specified value</td><td>≦ Initial specified value</td></tr><tr><td>Capacitance change</td><td>≦ ±20% of initial measured value (≦ ±30% for 4 W.V.)</td><td>≦ ±20% of initial measured value (≦ ±30% for 4 W.V.)</td></tr><tr><td>tan δ</td><td>≦ 150% of initial specified value</td><td>≦ 200% of initial specified value</td></tr></table></td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Shelf life</td><td>Test conditions
<table>
<tr><th>Item \ Series</th><th>VV</th><th>VA</th></tr>
<tr><td>Duration</td><td>1 000 h</td><td>1 000h</td></tr>
<tr><td>Ambient temperature</td><td>+105°C</td><td>+85°C</td></tr>
<tr><td>Applied voltage</td><td>(None)</td><td>(None)</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><th>Item \ Series</th><th>VV</th><th>VA</th></tr>
<tr><td>Leakage current</td><td>≤ Initial specified value</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±20% of initial measured value
(≦ ±30% for 4 W.V.)</td><td>≦ ±20% of initial measured value
(≦ ±30% for 4 W.V.)</td></tr>
<tr><td>tan δ</td><td>≤ 150% of initial specified value</td><td>≦ 200% of initial specified value</td></tr>
</table></td></tr>
<tr><td>Resistance to Soldering Heat</td><td>Test conditions
Capacitors shall be placed for 30 seconds on a plate (termination face down onto the plate) heated to +250°C.
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≤ Initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±10% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ Initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><th>Solvents \ Conditions</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Freon-TE, TES, TP35 or equivalents</td><td>Liquid or vapor</td><td>≦ 5 min (total)</td><td>≦ Boiling point at 1 atm</td><td>Acceptable</td></tr>
</table></td></tr>
</table>

PART NUMBER SYSTEM



W. V. Code	
Code	W.V.
0G	4V
0J	6.3V
1A	10V
1C	16V
1E	25V
1V	35V
1H	50V

Series Code	
V	VV Series
A	VA Series $\phi 4-6.3$
AS	VA Series $\phi 3$

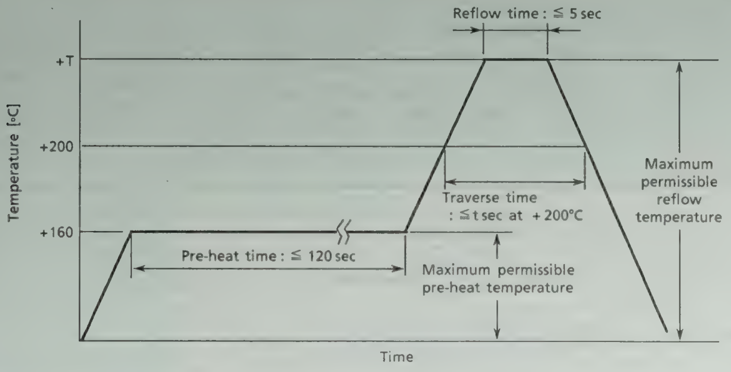
Capacitance Code in μF	
First two digits	Significant figures (where necessary, zero is preceded)
Third digit	Number of zeros to follow
"R" in three-digit block	Decimal point (where necessary, "R" is used as a decimal point. In this case, other two figures are significant.

Variation Code (VV Series only)
Refer to Standard Products Table for detailes.

Taping Code	
R	12.0mm width
P	16.0mm width

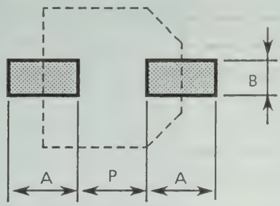
SOLDERING

■ Maximum Permissible Reflow Soldering Temperature Profile



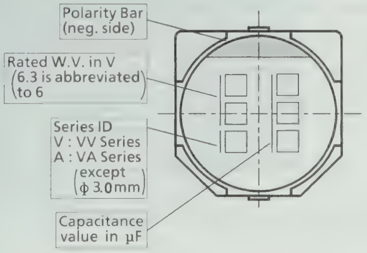
Series \ Item	T	t	Soldering
VV	≤ 240°C	≤ 30sec	Reflow only
VA	≤ 230°C	≤ 20sec	Reflow only

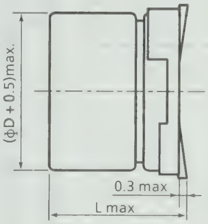
■ Land / pad dimensions as mounting guideline

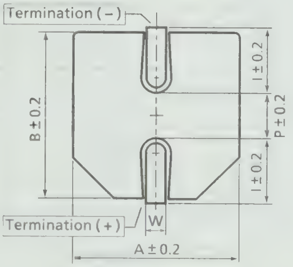


Case code \ Dim.[mm]	P	A	B
A	0.6	2.2	1.5
B	1.0	2.5	1.6
C	1.5	2.8	1.6
D	2.2	3.0	1.6

DIMENSIONS


Polarity Bar (neg. side)
Rated W.V. in V (6.3 is abbreviated to 6)
Series ID
V : VV Series
A : VA Series (except ϕ 3.0mm)
Capacitance value in μF

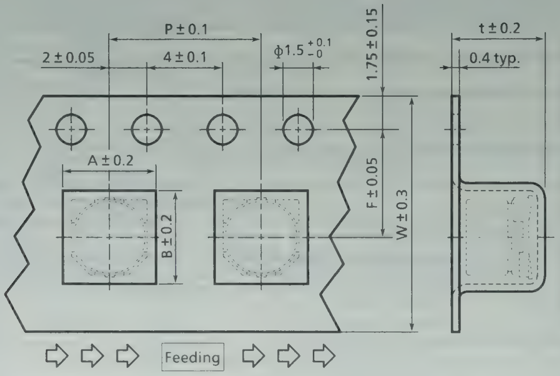




Size code \ Dim.[mm]	ϕD	L		A	B	l	P	W
		VV	VA					
A	3.0	—	6.0	3.3	3.3	1.5	0.6	0.45 - 0.75
B	4.0	5.5	6.0	4.3	4.3	1.8	1.0	0.5 - 0.8
C	5.0	5.5	6.0	5.3	5.3	2.2	1.5	0.5 - 0.8
D	6.3	5.5	6.0	6.6	6.6	2.4	2.2	0.5 - 0.8

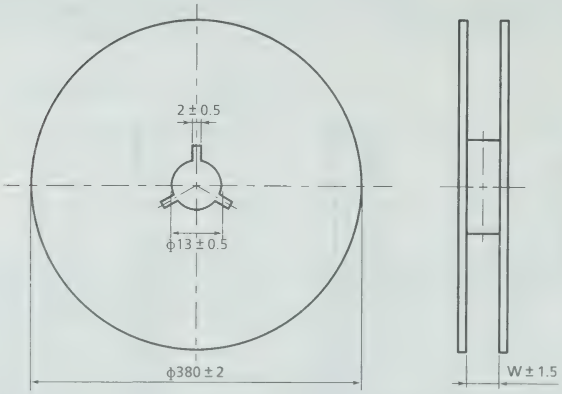
TAPING SPECIFICATIONS

■ Carrier Tape



Dim.[mm] Size code	W	P	t		A	B	F
			VV	VA			
A	12	8	–	6.2	3.5	3.5	5.5
B	12	8	5.8	6.2	4.7	4.6	5.5
C	16	12	5.8	6.4	6.0	6.0	7.5
D	16	12	5.8	6.4	7.0	7.0	7.5

PACKAGING



Item Size code	Dimension W [mm]	Quantity [pcs / reel]
A	14	2000
B	14	2000
C	18	1000
D	18	1000

STANDARD PRODUCTS TABLE

Rated W.V. [V.DC]	Nominal Capacitance (120Hz, +20°C) [μF]	Leakage Current Max. [μA]	VV Series			VA Series		
			Size Code	Max. Permissible ripple current (120Hz, +105°C) [mA rms]	Part Number	Size Code	Max. Permissible ripple current (120Hz, +85°C) [mA rms]	Part Number
4	22	3.0	—	—	—	A	19	ECEV0GAS220R
	33	3.0	B	26	ECEV0GV330SR	B	26	ECEV0GA330R
	47	3.0	B	26	ECEV0GV470SR	B	34	ECEV0GA470R
	100	4.0	C	61	ECEV0GV101SP	C	61	ECEV0GA101P
	220	8.8	D	82	ECEV0GV221SP	D	82	ECEV0GA221P
6.3	22	3.0	B	29.5	ECEV0JV220SR	B	29	ECEV0JA220R
	33	3.0	B	36	ECEV0JV330SR	C	38	ECEV0JA330P
	47	3.0	C	46	ECEV0JV470SP	C	46	ECEV0JA470P
	100	6.3	D	71	ECEV0JV101SP	D	71	ECEV0JA101P
10	22	3.0	—	—	—	C	35	ECEV1AA220P
	33	3.3	C	43	ECEV1AV330SP	C	43	ECEV1AA330P
	47	4.7	—	—	—	D	65	ECEV1AA470P
16	10	3.0	B	28	ECEV1CV100SR	A B	20 28	ECEV1CAS100R ECEV1CA100R
	22	3.5	C	39	ECEV1CV220SP	C	39	ECEV1CA220P
	33	5.2	—	—	—	D	60	ECEV1CA330P
	47	7.5	D	70	ECEV1CV470SP	D	70	ECEV1CA470P
25	4.7	3.0	B	22	ECEV1EV4R7SR	A B	12 22	ECEV1EAS4R7R ECEV1EA4R7R
	6.8	3.0	B	25	ECEV1EV6R8SR	B	25	ECEV1EA6R8R
	10	3.0	C	28	ECEV1EV100SP	C	28	ECEV1EA100P
	22	5.5	D	55	ECEV1EV220SP	D	55	ECEV1EA220P
	33	8.2	D	65	ECEV1EV330SP	D	65	ECEV1EA330P
35	2.2	3.0	—	—	—	A	8	ECEV1VAS2R2R
	3.3	3.0	—	—	—	A	10	ECEV1VAS3R3R
	4.7	3.0	B	22	ECEV1VV4R7SR	B	22	ECEV1VA4R7R
	10	3.5	C	30	ECEV1VV100SP	C	30	ECEV1VA100P
	22	7.7	D	60	ECEV1VV220SP	D	60	ECEV1VA220P

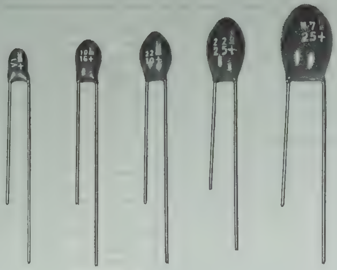
STANDARD PRODUCTS TABLE

Rated W.V. [V.DC]	Nominal Capacitance (120Hz, +20°C) [μF]	Leakage Current Max. [μA]	VV Series			VA Series		
			Size Code	Max. Permissible ripple current (120Hz, +105°C) [mA rms]	Part Number	Size Code	Max. Permissible ripple current (120Hz, +85°C) [mA rms]	Part Number
50	0.1	3.0	B	1.0	ECEV1HV0R1SR	A B	1 1	ECEV1HAS0R1R ECEV1HA0R1R
	0.15	3.0	B	1.5	ECEV1HVR15SR	B	1.5	ECEV1HAR15R
	0.22	3.0	B	2.3	ECEV1HVR22SR	A B	2 2	ECEV1HASR22R ECEV1HAR22R
	0.33	3.0	B	3.5	ECEV1HVR33SR	A B	3 3	ECEV1HASR33R ECEV1HAR33R
	0.47	3.0	B	5	ECEV1HVR47SR	A B	5 5	ECEV1HASR47R ECEV1HAR47R
	0.68	3.0	B	7	ECEV1HVR68SR	B	7	ECEV1HAR68R
	1.0	3.0	B	10.6	ECEV1HV010SR	A B	8 10	ECEV1HAS010R ECEV1HA010R
	1.5	3.0	B	13	ECEV1HV1R5SR	B	13	ECEV1HA1R5R
	2.2	3.0	B	16	ECEV1HV2R2SR	B	16	ECEV1HA2R2R
	3.3	3.0	B	18	ECEV1HV3R3SR	B	16	ECEV1HA3R3R
	4.7	3.0	C D	23 23	ECEV1HV4R7VP ECEV1HV4R7SP	C	23	ECEV1HA4R7P
	6.8	3.4	C D	27 29	ECEV1HV6R8VP ECEV1HV6R8SP	C	27	ECEV1HA6R8P
	10	5.0	D	35	ECEV1HV100SP	D	35	ECEV1HA100P

EF Series

Resin Dipped Tantalum

FEATURES



- **Endurance : 1 000h at +85°C with Voltage rating / at +105°C with voltage derating**
- **Operating Temperature : −40 to +105°C with voltage derating**
- **Taping for automatic insertion**

SPECIFICATIONS

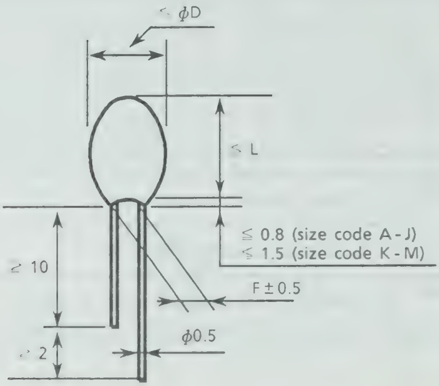
<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td><table><tr><td>Operating Temperature</td><td>Conditions</td></tr><tr><td>-55°C to +105°C</td><td>Voltage derating for ratings ≥ 10V DC</td></tr><tr><td>-55°C to +85°C</td><td>Voltage rating</td></tr></table></td></tr>
<tr><td>Rated Working Voltage Range</td><td>4V to 50V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td>0.047μF to 470μF (120Hz, +20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td>±20% or ±10% (120Hz, +20°C)</td></tr>
<tr><td>DC Leakage Current</td><td>I = 0.008C·V or 0.05 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C. (C = nominal capacitance in micro-farads, V = rated working voltage in volts)</td></tr>
<tr><td>Tangent of Loss Angle</td><td>Tan δ (120Hz, +20°C)<table><tr><td>4V rating</td><td colspan="3">≤ 0.1</td></tr><tr><td rowspan="2">≥ 6.3V rating</td><td>≤ 1μF</td><td>>1μF - <100μF</td><td>≥ 100μF</td></tr><tr><td>≤ 0.04</td><td>≤ 0.06</td><td>≤ 0.08</td></tr></table></td></tr>
<tr><td>Rated and Derated Voltage</td><td><table><tr><td rowspan="2">Working voltage [V]</td><td>Rated</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Derated</td><td>8.1</td><td>13</td><td>20.5</td><td>28.5</td><td>41</td></tr></table></td></tr>
<tr><td>Surge Voltage</td><td><table><tr><td>Rated Working Voltage [V]</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Surge Voltage [V]</td><td>5</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td></tr></table></td></tr>
<tr><td>Characteristics at High and Low Temperature</td><td><table><tr><td>−55°C</td><td>Capacitance change</td><td>≤ ±10% of initial measured value at +20°C</td></tr><tr><td rowspan="2">+85°C</td><td>Leakage Current</td><td>≤ 10 times of initial specified value</td></tr><tr><td>Capacitance change</td><td>≤ ±10% of initial measured value at +20°C</td></tr></table></td></tr>
</table>

SPECIFICATIONS (continued)

Item	Performance Characteristics		
Moisture Resistance	Test Conditions		
	Relative humidity	90% to 95%	
	Temperature	+40°C	
	Duration	500 h	
	Post test requirements at +20°C		
	Leakage current	≦ 0.012CV or 0.75 [μA] whichever is greater	
	Capacitance change	≦ ±10% of initial measured value	
	tan δ	≦ 150% of initial specified value	
Endurance	Test conditions: either derating or rating		
	Item \ Conditions	Derating	Rating
	Duration	1 000 h +48, −0 h	2 000 h +48, −0 h
	Ambient temperature	+105°C ±2°C	+85°C ±2°C
	Applied voltage	Derated working voltage	Rated working voltage
	Source impedance	1Ω / V	1Ω / V
	Post test requirements at +20°C		
	Leakage current	≦ 0.01C·V or 0.625 [μA]	
	Capacitance change	≦ ±10% of initial measured value	
	tan δ	≦ Initial specified value	

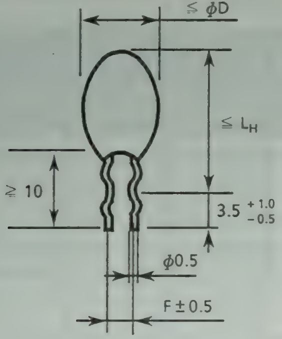
Dimensions

■Straight Leads



Size Code	φD	L	F
A	3.3	5.0	2.5 ± 0.5
B	3.3	5.5	2.5 ± 0.5
C	3.5	5.5	2.5 ± 0.5
D	3.7	6.5	2.5 ± 0.5
E	4.0	7.0	2.5 + 1.0, − 0.5
F	4.5	7.0	2.5 + 1.0, − 0.5
G	4.7	8.0	2.5 + 1.0, − 0.5
H	5.2	8.5	2.5 + 1.0, − 0.5
I	5.5	9.5	2.5 + 1.0, − 0.5
J	6.0	11.0	2.5 + 1.0, − 0.5
K	7.5	12.5	5.0 ± 0.5
L	9.0	14.5	5.0 ± 0.5
M	10.0	15.5	5.0 ± 0.5

■Snap-in Leads (Not standard)



Size Code	φD	L_H	F
A	4.5	10.0	5.0 ± 0.5
B	4.5	10.5	5.0 ± 0.5
C	4.5	10.5	5.0 ± 0.5
D	5.0	11.5	5.0 ± 0.5
E	5.5	12.0	5.0 ± 0.5
F	5.5	12.0	5.0 ± 0.5
G	6.0	13.0	5.0 ± 0.5
H	6.0	13.5	5.0 ± 0.5
I	7.0	14.5	5.0 ± 0.5
J	7.5	16.0	5.0 ± 0.5

PART NUMBER SYSTEM

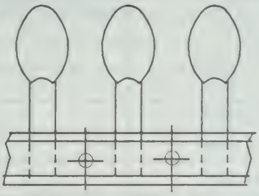
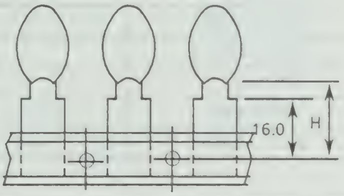
E C S F □ □ E □ □ □ □ □

W.V. Code			
Code	W. V.	Code	W. V.
0G	4V	1E	25V
0J	6.3V	1V	35V
1A	10V	1H	50V
1C	16V	–	–

Capacitance Code in pF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Cap. Tol. Code	
(None)	± 20%
K	± 10%

※ Not standard

<table>
<tr><th colspan="3">Suffix for Configuration</th></tr>
<tr><th>Suffix</th><th>Configuration</th><th>Packaging</th></tr>
<tr><td>(none)</td><td>Long lead</td><td>Bulk</td></tr>
<tr><td>※E</td><td>Snap-in leads</td><td>Bulk</td></tr>
<tr><td>※B1</td><td>Taping

<table>
<tr><th>Lead spacing</th><th>Size code</th></tr>
<tr><td>2.5mm</td><td>A - I</td></tr>
</table></td><td>Fan fold box
Quantity :
2 000 pcs / box</td></tr>
<tr><td>※BB</td><td rowspan="2">Taping


For new design, it is recommended to select suffix BB.
<table>
<tr><th>Suffix</th><th>Lead spacing</th><th>Dim. H</th><th>Size code</th></tr>
<tr><td>BB</td><td>5mm</td><td>18.5mm</td><td>A - I</td></tr>
<tr><td>B</td><td>5mm</td><td>21.5mm</td><td>A - I</td></tr>
</table></td><td rowspan="2">Fan fold box
Quantity :
2 000 pcs / box</td></tr>
<tr><td>※B</td></tr>
</table>

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≦ (+20°C) [μF]
4	6.8	ECSF0GE685K	C	0.3
	10	ECSF0GE106K	C	0.4
	15	ECSF0GE156K	D	0.5
	22	ECSF0GE226K	E	0.8
	33	ECSF0GE336K	F	1.1
	47	ECSF0GE476K	G	1.6
	68	ECSF0GE686	H	2.2
	100	ECSF0GE107	I	3.2
	150	ECSF0GE157	J	4.8
	220	ECSF0GE227	K	7.1
	330	ECSF0GE337	L	10.6
	470	ECSF0GE477	M	15.1
6.3	4.7	ECSF0JE475K	C	0.3
	6.8	ECSF0JE685K	C	0.4
	10	ECSF0JE106K	D	0.6
	15	ECSF0JE156K	E	0.8
	22	ECSF0JE226K	F	1.2
	33	ECSF0JE336K	G	1.7
	47	ECSF0JE476	H	2.4
	68	ECSF0JE686	I	3.5
	100	ECSF0JE107	J	5.1
	150	ECSF0JE157	K	7.6
	220	ECSF0JE227	L	11.1
	330	ECSF0JE337	M	16.7
10	2.2	ECSF1AE225K	B	0.2
	3.3	ECSF1AE335K	C	0.3
	4.7	ECSF1AE475K	C	0.4
	6.8	ECSF1AE685K	D	0.6
	10	ECSF1AE106K	E	0.8
	15	ECSF1AE156K	F	1.2
	22	ECSF1AE226K	G	1.8
	33	ECSF1AE336K	H	2.7
	47	ECSF1AE476K	I	3.8
	68	ECSF1AE686	J	5.5
	100	ECSF1AE107	K	8.0
	150	ECSF1AE157	L	12.0
	220	ECSF1AE227	M	17.6

STANDARD PRODUCTS TABLE

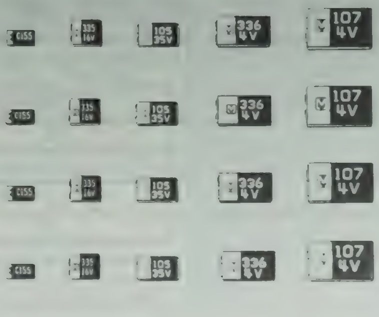
Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≦ (+20°C) [μA]
16	1	ECSF1CE105K	A	0.2
	1.5	ECSF1CE155K	B	0.2
	2.2	ECSF1CE225K	C	0.3
	3.3	ECSF1CE335K	C	0.5
	4.7	ECSF1CE475K	D	0.7
	6.8	ECSF1CE685K	E	0.9
	10	ECSF1CE106K	F	1.3
	15	ECSF1CE156K	G	2.0
	22	ECSF1CE226K	H	2.9
	33	ECSF1CE336K	I	4.3
	47	ECSF1CE476	J	6.1
	68	ECSF1CE686	K	8.8
	100	ECSF1CE107	L	12.8
	150	ECSF1CE157	M	19.2
25	1.5	ECSF1EE155K	C	0.3
	2.2	ECSF1EE225K	C	0.5
	3.3	ECSF1EE335K	D	0.7
	4.7	ECSF1EE475K	E	1.0
	6.8	ECSF1EE685K	F	1.4
	10	ECSF1EE106K	H	2.0
	15	ECSF1EE156K	I	3.0
	22	ECSF1EE226	J	4.4
	33	ECSF1EE336	K	6.6
	47	ECSF1EE476	L	9.4
	68	ECSF1EE686	M	13.6

STANDARD PRODUCTS TABLE

Rated DC Working Voltage [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	Leakage Current : ≤ (+20°C) [μA]
35	0.047	ECSF1VE473	A	0.05
	0.068	ECSF1VE683	A	0.05
	0.1	ECSF1VE104	A	0.05
	0.15	ECSF1VE154	A	0.05
	0.22	ECSF1VE224	A	0.07
	0.33	ECSF1VE334	A	0.1
	0.47	ECSF1VE474	B	0.2
	0.68	ECSF1VE684	B	0.2
	1	ECSF1VE105K	C	0.3
	1.5	ECSF1VE155K	C	0.5
	2.2	ECSF1VE225K	D	0.7
	3.3	ECSF1VE335K	E	1.0
	4.7	ECSF1VE475K	F	1.4
	6.8	ECSF1VE685K	H	2.0
	10	ECSF1VE106K	I	2.8
	15	ECSF1VE156	J	4.2
	22	ECSF1VE226	K	6.2
	33	ECSF1VE336	L	9.3
	47	ECSF1VE476	M	13.2
50	0.1	ECSF1HE104	A	0.05
	0.15	ECSF1HE154	A	0.06
	0.22	ECSF1HE224	B	0.09
	0.33	ECSF1HE334	C	0.2
	0.47	ECSF1HE474	D	0.2
	0.68	ECSF1HE684	D	0.3
	1	ECSF1HE105K	E	0.4
	1.5	ECSF1HE155K	F	0.6
	2.2	ECSF1HE225K	G	0.9
	3.3	ECSF1HE335K	H	1.4
	4.7	ECSF1HE475K	I	1.9
	6.8	ECSF1HE685	K	2.8
	10	ECSF1HE106	L	4.0
	15	ECSF1HE156	M	6.0

TEH Series
Surface Mount Type

FEATURES



- **Basic Specifications : IECQ-QC300800, IECQ-QC300801/US0001**
- **Moisture Resistance : 1 000 h at 90-95%RH, +60°C**
- **High solderability : new solder coverage ≧ 95%**
- **Tape & reel packaging for automatic placement**

SPECIFICATIONS

Item	Performance Characteristics
Operating Temperature Range	Operating Temperature / Conditions -55°C to +125°C / Voltage derating -55°C to +85°C / Voltage rating
Rated Working Voltage Range	4V to 35V DC
Nominal Capacitance Range	0.047μF to 100μF (120Hz, +20°C)
Capacitance Tolerance	±20% or ±10% (120Hz, +20°C)
DC Leakage Current	I = 0.01C·V or 0.5 [μA] whichever is greater measured after a 2 minute application of rated working voltage at +20°C. (C = nominal capacitance in micro-farads, V = rated working voltage in volts)
Tangent of Loss Angle	See table below
Rated and Derated Voltage	See table below
Characteristics at High and Low Temperature	See table below

Operating Temperature Range

Operating Temperature	Conditions
-55°C to +125°C	Voltage derating
-55°C to +85°C	Voltage rating

Tangent of Loss Angle

Capacitance [μF]	≦ 3.3	4.7 to 68	100
tan δ (120Hz, +20°C)	≦ 0.04	≦ 0.06	≦ 0.08

Rated and Derated Voltage

Working voltage [V]	Rated	4	6.3	10	16	20	25	35
	Derated	2.7	4	7	10	13	17	23
Surge voltage [V]	Rated	5	8	13	20	26	32	46
	Derated	3.4	5	9.0	12	16	20	26

Characteristics at High and Low Temperature

−55°C	Capacitance change	≦ ±10% of initial measured value
+85°C	Leakage Current	≦ 10 times of initial specified value
	Capacitance change	≦ ±10% of initial measured value
+125°C	Leakage current	≦ 12.5 times of initial specified value
	Capacitance change	≦ ±12% of initial measured value

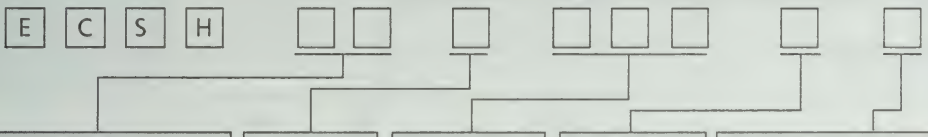
SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Rapid Change of Temperature</td><td>Number of cycle : 100
<table>
<tr><th>Step \ Conditions</th><th>Temperature</th><th>Duration</th></tr>
<tr><td>1</td><td>−55°C +0, −3°C</td><td>30 min ± 3 min</td></tr>
<tr><td>2</td><td>Normal</td><td>≦ 3 min</td></tr>
<tr><td>3</td><td>+125°C +3, −0°C</td><td>30 min ± 3 min</td></tr>
<tr><td>4</td><td>Normal</td><td>≦ 3 min</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ 125% of initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±5% of initial measured value</td></tr>
<tr><td>tan δ</td><td>< Initial specified value</td></tr>
</table></td></tr>
<tr><td>Impedance at High Frequency</td><td>
<table>
<tr><th>Capacitance [μF]</th><th>Impedance (100kHz. +20°C) [Ω]</th></tr>
<tr><td>0.047 to 0.22</td><td>≦ 60</td></tr>
<tr><td>0.33 to 0.68</td><td>≦ 15</td></tr>
<tr><td>1.0 to 6.8</td><td>≦ 8</td></tr>
<tr><td>10 to 33</td><td>≦ 3</td></tr>
<tr><td>47 to 100</td><td>≦ 1</td></tr>
</table></td></tr>
<tr><td>Resistance to Soldering Heat</td><td>Test conditions
<table>
<tr><td>Solder bath temperature</td><td>+260°C ±5°C</td></tr>
<tr><td>Immersion time</td><td>10s ±1s</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±5% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ initial specified value</td></tr>
<tr><td>Impedance</td><td>≦ initial specified value</td></tr>
</table></td></tr>
<tr><td>Solderability</td><td>New solder coverage ≧ 95% under following conditions
<table>
<tr><td>Pretreatment</td><td>Immersion into flux (25% rosin with alcohol)</td></tr>
<tr><td>Solder bath temperature</td><td>+230°C ±5°C</td></tr>
<tr><td>Immersion time</td><td>2 sec ±0.5 sec</td></tr>
</table></td></tr>
<tr><td>Moisture Resistance</td><td>Test Conditions
<table>
<tr><td>Relative humidity</td><td>90% to 95%</td></tr>
<tr><td>Temperature</td><td>+60°C</td></tr>
<tr><td>Duration</td><td>1 000 h</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ 0.02CV or 1 [μA] whichever is greater</td></tr>
<tr><td>Capacitance change</td><td>≦ ±10% of initial measured value</td></tr>
<tr><td>tan δ</td><td>< initial specified value</td></tr>
</table></td></tr>
</table>

SPECIFICATIONS (continued)

<table>
<tr><th>Item</th><th>Performance Characteristics</th></tr>
<tr><td>Endurance</td><td>Test conditions : either derating or rating
<table>
<tr><th>Item \ Conditions</th><th>Derating</th><th>Rating</th></tr>
<tr><td>Duration</td><td>2 000 h +72, −0 h</td><td>2 000 h +72, −0 h</td></tr>
<tr><td>Ambient temperature</td><td>+125°C ±2°C</td><td>+85°C ±2°C</td></tr>
<tr><td>Applied voltage</td><td>Derated working voltage</td><td>Rated working voltage</td></tr>
<tr><td>Source impedance</td><td>1Ω/V</td><td>1Ω/V</td></tr>
</table>
Post test requirements at +20°C
<table>
<tr><td>Leakage current</td><td>≦ 125% of initial specified value</td></tr>
<tr><td>Capacitance change</td><td>≦ ±10% of initial measured value</td></tr>
<tr><td>tan δ</td><td>≦ Initial specified value</td></tr>
</table></td></tr>
<tr><td>Cleaning</td><td>Capacitors shall be capable of withstanding exposure to following cleaning solvents.
<table>
<tr><th>Solvents \ Conditions</th><th>Solvent structure</th><th>Exposure time</th><th>Temperature</th><th>Ultrasonic wave</th></tr>
<tr><td>Hydrocarbon family</td><td>Liquid or vapor</td><td>≦ 5 min (total)</td><td>≦ +50°C at 1 atm</td><td>Acceptable (single mode only)</td></tr>
</table></td></tr>
</table>

PART NUMBER SYSTEM

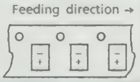


W.V. Code			
Code	W. V.	Code	W. V.
0G	4V	1D	20V
0J	6.3V	1E	25V
1A	10V	1V	35V
1C	16V	–	–

Size Code	
Code	IECQ
Y	3216
X	3528
C	6032
D	7343

Capacitance Code in ρF	
First two digits	Significant figures
Third digit	Number of zeros to follow

Cap. Tol. Code	
(None)	±20%
K	±10%

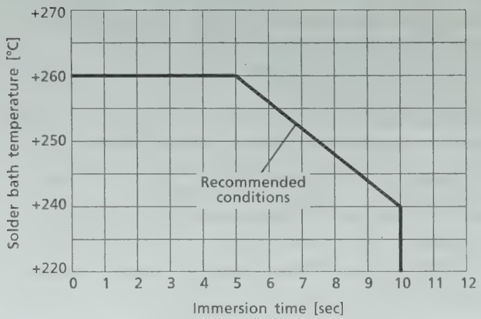
Suffix for Taping		
Suffix	Reel ϕA	Polarity
R	178mm	Feeding direction → 

SOLDERING

■ Flow (wave) soldering

Recommended soldering conditions for TEH Series capacitors are shown in the figure 1.

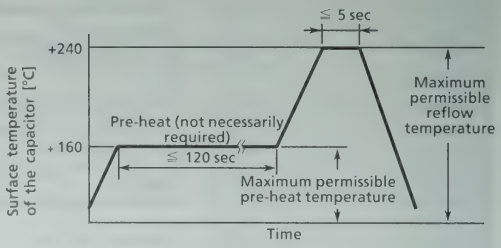
Figure 1 Recommended flow soldering conditions



■ Reflow soldering

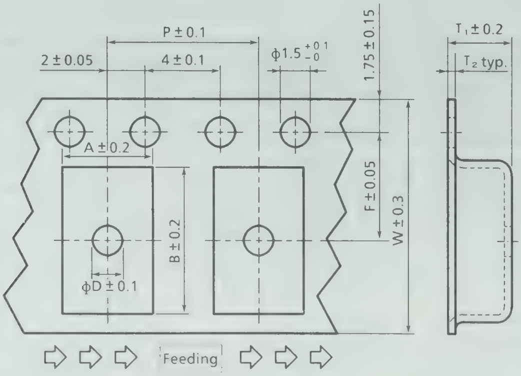
When establishing a reflow soldering temperature profile for TEH Series capacitors, the surface temperature of any place of the capacitor should not exceed the limits of time and temperatures shown in the figure 2.

Figure 2 Maximum permissible reflow soldering conditions



TAPING AND PACKAGING SPECIFICATIONS

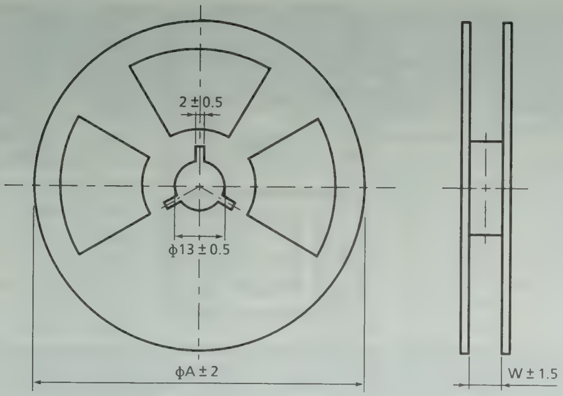
■ Carrier Tape



Dimensions [mm]

Size Code	Size Code (QC300801/ US0001)	W ± 0.3	A ± 0.2	B ± 0.2	P ± 0.1	T_1 ± 0.2	F ± 0.1	T_2 typ.	ϕD ± 0.1
Y	3216	8.0	1.9	3.5	4.0	1.9	3.5	0.2	1.1
X	3528	8.0	3.3	3.8	4.0	2.1	3.5	0.2	1.1
C	6032	12.0	3.7	6.4	8.0	3.0	5.5	0.3	1.6
D	7343	12.0	4.7	7.7	8.0	3.3	5.5	0.3	1.6

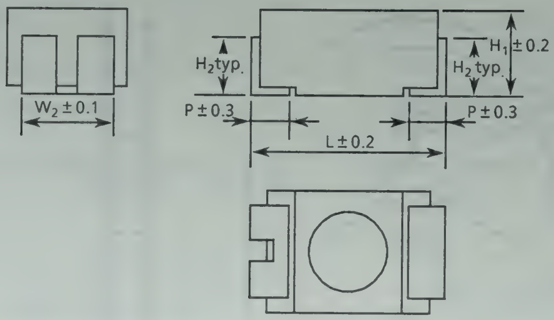
■ Reel



Dimensions [mm]

Size code	Size code (IEC QC-300801/US0001)	Dimensions [mm]		Quantity
		ϕA	W	
Y	3216	178	10.0	2 000
X	3528	178	10.0	2 000
C	6032	178	14.0	750
D	7343	178	14.0	750

DIMENSIONS



Size code	Dimensions [mm] Size code (QC-300801/US000)	L	W$_1$	W$_2$	H$_1$	H$_2$	P
Y	3216	3.2	1.6	1.2	1.6	1.0	0.8
X	3528	3.5	2.8	2.2	1.9	1.2	0.8
C	6032	6.0	3.2	2.2	2.5	1.5	1.3
D	7343	7.3	4.3	2.4	2.8	1.6	1.3

STANDARD RATINGS & CASE SIZE MATRIX

Cap. [μF]	W.V. [V]	4	6.3	10	16	20	25	35
	Cap. Code / W.V. Code	0G	0J	1A	1C	1D	1E	1V
0.047	473							Y
0.068	683							Y
0.10	104							Y
0.15	154							Y
0.22	224							Y
0.33	334							Y
0.47	474						Y	X
0.68	684				Y	Y		X
1.0	105				Y			X
1.5	155				Y		X	C
2.2	225			Y	X	X		C
3.3	335		Y		X		C	D
4.7	475	Y		X	C	C		D
6.8	685		X		C	C		D
10	106	X		C	C		D	
15	156		C	C	D	D		
22	226	C	C		D			
33	336	C		D	D			
47	476		D	D				
68	686	D	D					
100	107	D						

STANDARD PRODUCTS TABLE

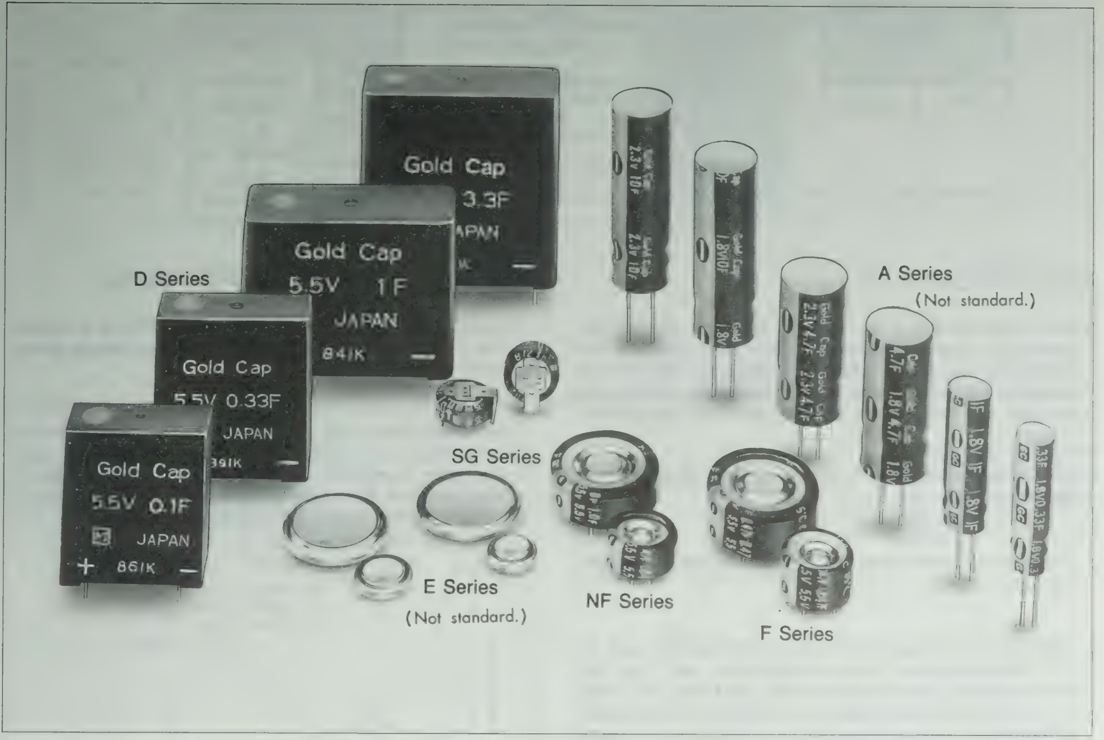
Rated DC W. V. [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	IECQ QC300801 / US0001 Size Code	Leakage Current (+20°C) [μF] : ≦	tan δ (120Hz) (+20°C) : ≦	Impedance (100kHz, +20°C) [Ω] : ≦
4	4.7	ECSH0GY475R	Y	3216	0.50	0.06	8
	10	ECSH0GX106R	X	3528	0.50	0.06	3
	22	ECSH0GC226R	C	6032	0.88	0.06	3
	33	ECSH0GC336R	C	6032	1.32	0.06	3
	68	ECSH0GD686R	D	7343	2.72	0.06	1
	100	ECSH0GD107R	D	7343	4.00	0.08	1
6.3	3.3	ECSH0JY335R	Y	3216	0.50	0.04	8
	6.8	ECSH0JX685R	X	3528	0.50	0.06	8
	15	ECSH0JC156R	C	6032	0.94	0.06	3
	22	ECSH0JC226R	C	6032	1.38	0.06	3
	47	ECSH0JD476R	D	7343	2.96	0.06	1
	68	ECSH0JD686R	D	7343	4.28	0.06	1
10	2.2	ECSH1AY225R	Y	3216	0.50	0.04	8
	4.7	ECSH1AX475R	X	3528	0.50	0.06	8
	10	ECSH1AC106R	C	6032	1.00	0.06	3
	15	ECSH1AC156R	C	6032	1.50	0.06	3
	33	ECSH1AD336R	D	7343	3.30	0.06	3
	47	ECSH1AD476R	D	7343	4.70	0.06	1
16	0.68	ECSH1CY684R	Y	3216	0.50	0.04	15
	1.0	ECSH1CY105R	Y	3216	0.50	0.04	8
	1.5	ECSH1CY155R	Y	3216	0.50	0.04	8
	2.2	ECSH1CX225R	X	3528	0.50	0.04	8
	3.3	ECSH1CX335R	X	3528	0.52	0.04	8
	4.7	ECSH1CC475R	C	6032	0.75	0.06	8
	6.8	ECSH1CC685R	C	6032	1.08	0.06	8
	10	ECSH1CC106R	C	6032	1.60	0.06	3
	15	ECSH1CD156R	D	7343	2.40	0.06	3
	22	ECSH1CD226R	D	7343	3.52	0.06	3
	33	ECSH1CD336R	D	7343	5.28	0.06	3
20	0.68	ECSH1DY684R	Y	3216	0.50	0.04	15
	2.2	ECSH1DX225R	X	3528	0.50	0.04	8
	4.7	ECSH1DC475R	C	6032	0.94	0.06	8
	6.8	ECSH1DC685R	C	6032	1.36	0.06	8
	15	ECSH1DD156R	D	7343	3.00	0.06	3
25	0.47	ECSH1EY474R	Y	3216	0.50	0.04	15
	1.5	ECSH1EX155R	X	3528	0.50	0.04	8
	3.3	ECSH1EC335R	C	6032	0.82	0.04	8
	10	ECSH1ED106R	D	7343	2.50	0.06	3

STANDARD PRODUCTS TABLE

Rated DC W. V. [V]	Nominal Capacitance (120Hz, +20°C) [μF]	Part Number	Size Code	IECQ QC300801 / US0001 Size Code	Leakage Current (+20°C) [μF] : ≦	tan δ (120Hz) (+20°C) : ≦	Impedance (100kHz, +20°C) [Ω] : ≦
35	0.047	ECSH1VY473R	Y	3216	0.50	0.04	60
	0.068	ECSH1VY683R	Y	3216	0.50	0.04	60
	0.10	ECSH1VY104R	Y	3216	0.50	0.04	60
	0.15	ECSH1VY154R	Y	3216	0.50	0.04	60
	0.22	ECSH1VY224R	Y	3216	0.50	0.04	60
	0.33	ECSH1VY334R	Y	3216	0.50	0.04	15
	0.47	ECSH1VX474R	X	3528	0.50	0.04	15
	0.68	ECSH1VX684R	X	3528	0.50	0.04	15
	1.0	ECSH1VX105R	X	3528	0.50	0.04	8
	1.5	ECSH1VC155R	C	6032	0.52	0.04	8
	2.2	ECSH1VC225R	C	6032	0.77	0.04	8
	3.3	ECSH1VD335R	D	7343	1.15	0.04	8
	4.7	ECSH1VD475R	D	7343	1.64	0.06	8
	6.8	ECSH1VD685R	D	7343	2.38	0.06	8

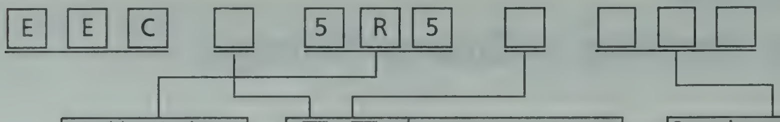
Gold Capacitors

For IC Memory Back-up & Energy Storage



Series	Load	Rated Working Voltage [V]	Nominal Capacitance Range [F]	Capacitance Tolerance [%]	Operating Temperature [°C]	High Temperature Loading
SG	μA range	5.5	0.022 to 0.22	–20, +80	–25 to +70	1 000h at +70°C
NF	μA range	5.5	0.033 to 1.00	–20, +80	–25 to +70	1 000h at +70°C
F	μA range	5.5	0.033 to 0.68	–20, +80	–25 to +85	1 000h at +85°C
D	mA range	5.5	0.1, 0.33	–20, +80	–25 to +70	1 000h at +70°C
			1, 3.3	–20, +40	–25 to +70	

PART NUMBER SYSTEM



Working Voltage Code	
Code	W. V.
5R5	5.5V

☐	☐	Series
S	V	SG : configuration V
S	H	SG : configuration H
F	U	NF
F	H	F
W	D	D

Capacitance Code in μF	
First two digits	Significant figures
Third digit	Number of zeros to follow

APPLICATION NOTE

1. Gold Capacitors are not suitable for rapid charge and discharge applications and usage in this mode is not recommended. Internal heat generated by this type of operation may result in reduction of capacitance, mechanical damage and degradation of other electrical parameters.

2. Do not apply a voltage in excess of the capacitor rated working voltage.

3. Filtering applications where ripple currents are present are not recommended.

4. Cleaning with Halogenated Hydrocarbon solvents such as 1,1,1-Trichloroethane, Tetrachloroethylene, etc. are not recommended. Acceptable solvents are Freon- TE, TES, TP-35. Recommended cleaning conditions are as follows:
   a) Immersion (ultrasonic wave is acceptable) and/or vapor methods at a temperature of boiling point or less at 1 atm
   b) Cleaning time; ≦5 minutes (total)

5. Capacitor life is highly dependent upon ambient operating temperature. Do not operate or subject the capacitor to temperatures in excess of its rating. For achieving the greatest life expectancy, it is recommended to operate at a reduced temperature.

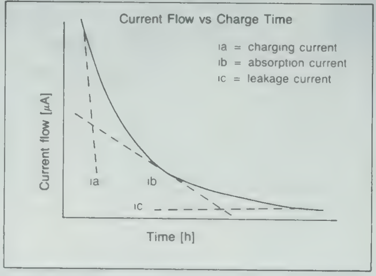
6. Operation under high humidity, moisture laden or corrosive gaseous atmosphres are not recommended. Because terminals and/or cases may corrode and cause an open circuit.

7. Excessive thermal stress during soldering may cause leakage of electrolyte and degradation of electrical properties. Recommended soldering conditions are as follows:
   Solder bath temperature; ≦+260°C
   Immersion time; ≦10 seconds

DEFINITION OF INFLOW CURRENT

"Inflow Current" in STANDARD PRODUCTS TABLE is defined as the current flow after a 30 or a 60 minute charge period at rated working voltage +20°C.

This current flow is the term given to the combination of currents flowing in a Gold Capacitor during its charge cycle. Unlike other capacitors, a Gold Capacitor takes longer to charge because of its high capacitance. The current flow in a Gold Capacitor passes through three phases:



The charging current (ia) is that current which the capacitor stores and is available for discharge.

The absorption current (ib) is that current which is absorbed by the capacitor and is not available for discharge.

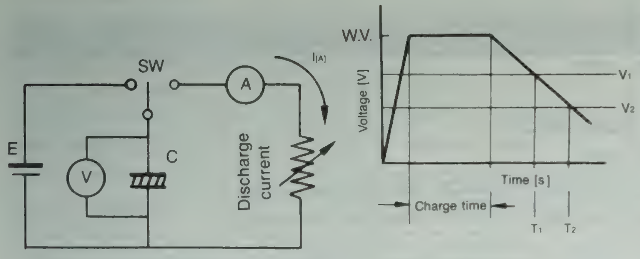
The leakage current (ic) is that current which flows through the capacitor due to the resistive losses of dielectric.

The reading of current flow after approximately 100 hours application of rated working voltage would present leakage current.

MEASUREMENT PROCEDURES

Initialization of test samples: Prior to test, Capacitors shall be charged at rated working voltage for 2 hours and discharged in short circuit for 12 to 24 hours under the condition of +20°C±10°C and 65%±10%RH.

1) Capacitance

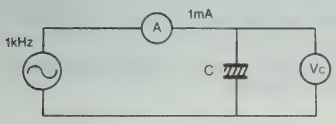


	SG, NF, F Series	D Series
Charge time	30 min	60 min
V_1	3.0V	3.0V
V_2	2.5V	2.5V

The discharge current shall be calculated by the capacitance value in a ratio of 1mA/F.

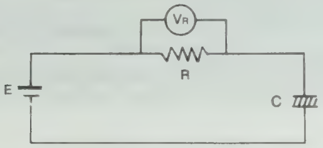
$$C[F] = \frac{I[A] \times (T_2 - T_1)\,[s]}{V_1 - V_2[V]}$$

2) Internal Resistance



$$Z[\Omega] = \frac{Vc}{10^{-3}}$$

3) Inflow Current



Inflow current shall be measured after a 30 or a 60 minute application of the rated working voltage.

$$IC_{[A]} = \frac{V_R}{R}$$

Gold Capacitor SG Series

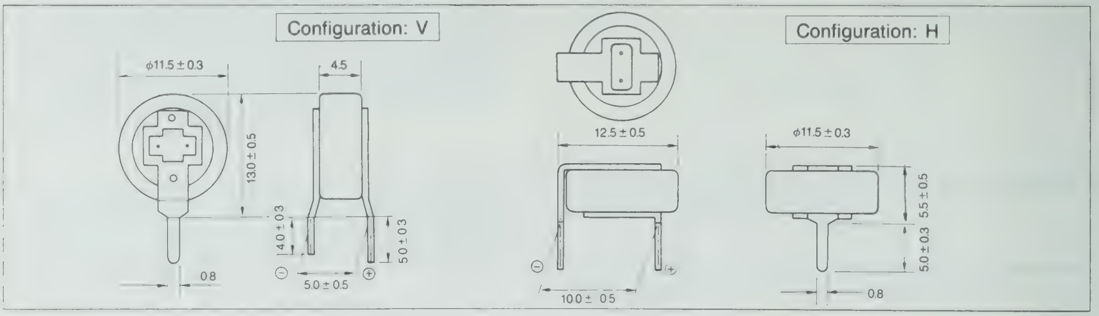
FEATURES

- IC Memory Back-up Device (μA Range Load)
- Volumetric Efficiency (50% Smaller than NF Series)
- Light Weight (1.2g)
- General Purpose

SPECIFICATIONS

Item	Performance Characteristics
Operating Temperature Range	−25°C to +70°C
Rated Working Voltage	5.5V DC
Nominal Capacitance Range	0.022F to 0.22F (+20°C)
Capacitance Tolerance	−20% to +80%
Inflow Current	(Refer to "STANDARD PRODUCTS TABLE" for each value)
Internal Resistance	(Refer to "STANDARD PRODUCTS TABLE" for each value)
Characteristics at High and Low Temperature	−25°C & +70°C / Capacitance change / ≦±30% of the measured value at +20°C −25°C / Internal resistance / ≦5 times of the measured value at +20°C +70°C / Inflow current / ≦4 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after a 1,000 hour application of 5.5V DC at +70°C Capacitance change / ≦±30% of the initial measured value Internal resistance / ≦4 times of the initial specified value Inflow current / ≦2 times of the initial specified value
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after a 1,000 hour exposure to +70°C with no voltage applied.
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after a 500 hour exposure to +55°C/90 to 95%RH with 5.5V DC applied.

DIMENSIONS [mm]



STANDARD PRODUCTS TABLE

Rated Working Voltage [V dc]	Nominal Capacitance [F]	Part Number*	Inflow Current** [μA]	Internal Resistance (1kHz) [Ω]
5.5	0.022	EECS5R5☐223	38	150
	0.033	EECS5R5☐333	57	150
	0.047	EECS5R5☐473	69	120
	0.10	EECS5R5☐104	100	75
	0.22	EECS5R5☐224	165	75

*☐=V(Configuration: V) or H(Configuration: H)

**Inflow current shown in table is measured after a 30 minute application of rated working voltage. In actual use, this current will decrease to several μA level after approximately 10 hours application of rated working voltage.

Gold Capacitor
NF Series

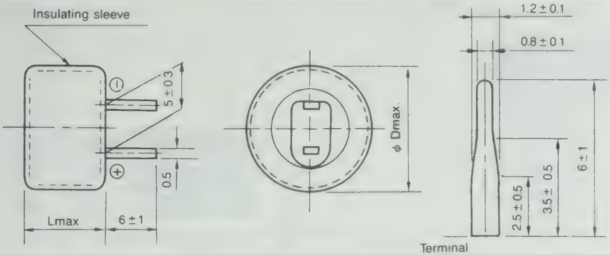
FEATURES

- IC Memory Back-up Device (μA Range Load)
- Large Capacitance for Long Time Back-up
- General Purpose
- 5mm Terminal Spacing

SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="3">Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td colspan="3">−25°C to +70°C</td></tr>
<tr><td>Rated Working Voltage</td><td colspan="3">5.5V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td colspan="3">0.033F to 0.1F(A size), 0.33F to 1.0F(B size) (+20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="3">−20% to +80%</td></tr>
<tr><td>Inflow Current</td><td colspan="3">(Refer to "STANDARD PRODUCTS TABLE" for each value)</td></tr>
<tr><td>Internal Resistance</td><td colspan="3">(Refer to "STANDARD PRODUCTS TABLE" for each value)</td></tr>
<tr><td rowspan="3">Characteristics at High and Low Temperature</td><td>−25°C & +70°C</td><td>Capacitance change</td><td>≦±30% of the measured value at +20°C</td></tr>
<tr><td>−25°C</td><td>Internal resistance</td><td>≦5 times of the measured value at +20°C</td></tr>
<tr><td>+70°C</td><td>Inflow current</td><td>≦4 times of the measured value at +20°C</td></tr>
<tr><td rowspan="4">High Temperature Loading</td><td colspan="3">The capacitor shall meet the following limits after a 1,000 hour application of 5.5V DC at +70°C</td></tr>
<tr><td>Capacitance change</td><td colspan="2">≦±30% of the initial measured value</td></tr>
<tr><td>Internal resistance</td><td colspan="2">≦4 times of the initial specified value</td></tr>
<tr><td>Inflow current</td><td colspan="2">≦2 times of the initial specified value</td></tr>
<tr><td>Shelf life</td><td colspan="3">The capacitor shall meet the limits for "High Temperature Loading" after a 1,000 hour exposure to +70°C with no voltage applied.</td></tr>
<tr><td>Loading with Moisture</td><td colspan="3">The capacitor shall meet the limits specified for "High Temperature Loading" after a 500 hour exposure to +55°C/90 to 95%RH with 5.5V DC applied.</td></tr>
</table>

DIMENSIONS [mm]



Case Code	ϕD	L
A	13.5	7.5
B	21.5	8.0

STANDARD PRODUCTS TABLE

Rated Working Voltage [V dc]	Nominal Capacitance [F]	Case Code	Part Number	Inflow Current* [μA]	Internal Resistance (1kHz) [Ω]
5.5	0.033	A	EECF5R5U333	57	150
	0.047	A	EECF5R5U473	69	120
	0.1	A	EECF5R5U104	100	75
	0.33	B	EECF5R5U334	182	40
	0.47	B	EECF5R5U474	216	30
	1.0	B	EECF5R5U105	315	30

*Inflow current shown in table is measured after a 30 minute application of rated working voltage. In actual use, this current will decrease to several μA level after approximately 10 hours application of rated working voltage.

Gold Capacitor F Series

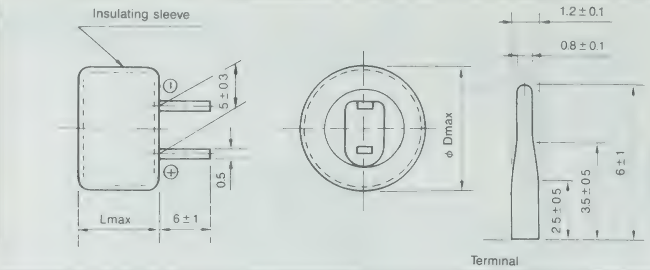
FEATURES

- IC Memory Back-up Device (μA Range Load)
- Industrial Grade (Max. Ope. Temp: +85°C)

SPECIFICATIONS

Item	Performance Characteristics
Operating Temperature Range	−25°C to +85°C
Rated Working Voltage	5.5V DC
Nominal Capacitance Range	0.033F to 0.1F(A size), 0.47F to 0.68F(B size) (+20°C)
Capacitance Tolerance	−20% to +80%
Inflow Current	(Refer to "STANDARD PRODUCTS TABLE" for each value)
Internal Resistance	(Refer to "STANDARD PRODUCTS TABLE" for each value)
Characteristics at High and Low Temperature	−25°C & +85°C: Capacitance change: ≦±30% of the measured value at +20°C −25°C: Internal resistance: ≦5 times of the measured value at +20°C +85°C: Inflow current: ≦4 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after a 1,000 hour application of 5.5V DC at +85°C Capacitance change: ≦±30% of the initial measured value Internal resistance: ≦4 times of the initial specified value Inflow current: ≦2 times of the initial specified value
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after a 1,000 hour exposure to +85°C with no voltage applied.
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after a 500 hour exposure to +55°C/90 to 95%RH with 5.5V DC applied.

DIMENSIONS [mm]



Case Code	φD	L
A	13.5	9.5
B	21.5	9.5

STANDARD PRODUCTS TABLE

Rated Working Voltage [V dc]	Nominal Capacitance [F]	Case Code	Part Number	Inflow Current* [μA]	Internal Resistance (1kHz) [Ω]
5.5	0.033	A	EECF5R5H333	57	150
	0.047	A	EECF5R5H473	69	120
	0.1	A	EECF5R5H104	100	100
	0.47	B	EECF5R5H474	216	75
	0.68	B	EECF5R5H684	315	50

*Inflow current shown in table is measured after a 30 minute application of rated working voltage. In actual use, this current will decrease to several μA level after approximately 10 hours application of rated working voltage.

Gold Capacitor D Series

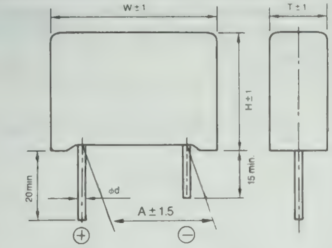
FEATURES

- Back-up for mA Range Load
- Large Capacitance (3.3F)
- Molded Case

SPECIFICATIONS

<table>
<tr><th>Item</th><th colspan="3">Performance Characteristics</th></tr>
<tr><td>Operating Temperature Range</td><td colspan="3">−25°C to +70°C</td></tr>
<tr><td>Rated Working Voltage</td><td colspan="3">5.5V DC</td></tr>
<tr><td>Nominal Capacitance Range</td><td colspan="3">0.1F to 3.3F (+20°C)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="3">−20% to +80% (0.1F, 0.33F), −20% to +40% (1F, 3.3F)</td></tr>
<tr><td>Inflow Current</td><td colspan="3">(Refer to "STANDARD PRODUCTS TABLE" for each value)</td></tr>
<tr><td>Internal Resistance</td><td colspan="3">(Refer to "STANDARD PRODUCTS TABLE" for each value)</td></tr>
<tr><td rowspan="3">Characteristics at High and Low Temperature</td><td>−25°C & +70°C</td><td>Capacitance change</td><td>≦±30% of the measured value at +20°C</td></tr>
<tr><td>−25°C</td><td>Internal resistance</td><td>≦3 times of the measured value at +20°C</td></tr>
<tr><td>+70°C</td><td>Inflow current</td><td>≦3 times of the measured value at +20°C</td></tr>
<tr><td rowspan="4">High Temperature Loading</td><td colspan="3">The capacitor shall meet the following limits after a 1,000 hour application of 5.5V DC at +70°C</td></tr>
<tr><td colspan="2">Capacitance change</td><td>≦±30% of the initial measured value</td></tr>
<tr><td colspan="2">Internal resistance</td><td>≦2 times of the initial specified value</td></tr>
<tr><td colspan="2">Inflow current</td><td>≦2 times of the initial specified value</td></tr>
<tr><td>Shelf Life</td><td colspan="3">The capacitor shall meet the limits for "High Temperature Loading" after a 1,000 hour exposure to +70°C with no voltage applied.</td></tr>
<tr><td>Loading with Moisture</td><td colspan="3">The capacitor shall meet the limits specified for "High Temperature Loading" after a 500 hour exposure to +55°C/90 to 95%RH with 5.5V DC applied.</td></tr>
</table>

DIMENSIONS [mm]



Case Code	Dimensions				
	W	T	H	A	φd
A	25	9	28	17.5	0.7
B	29	10	31.5	22.5	0.7
C	42.5	15	32.5	32.5	0.8
D	42.5	15	42.5	32.5	0.8

STANDARD PRODUCTS TABLE

Rated Working Voltage [V dc]	Nominal Capacitance [F]	Case Code	Part Number	Inflow Current* [mA]	Internal Resistance (1kHz) [Ω]
5.5	0.1	A	EECW5R5D104	0.12	9.0
	0.33	B	EECW5R5D334	0.18	5.0
	1	C	EECW5R5D105	0.28	5.0
	3.3	D	EECW5R5D335	0.44	2.5

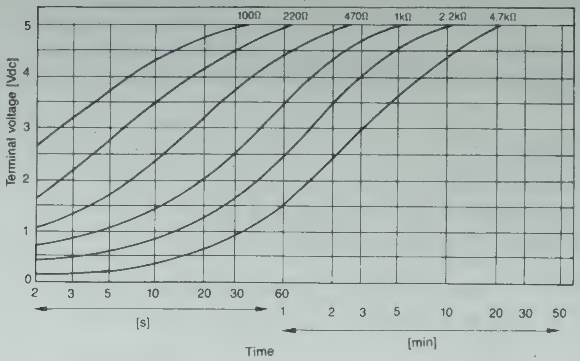
*The inflow current shown in the above table is measured after a 60 minute application of rated working voltage. In actual use, this current will decrease by a factor of 10 after approximately 10 hours application of rated working voltage.

CHARACTERISTICS

■ Charging Characteristics

•Terminal Voltage vs Time (+20°C)

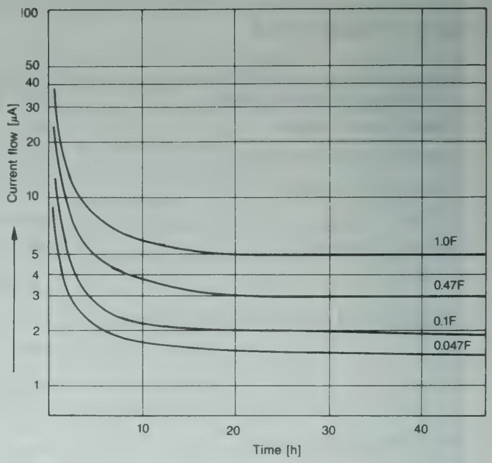
5.5V 0.047F (SG, NF Series)



(Note)
Measuring conditions:
After being shorted for 60 minutes at +20°C, the capacitor is charged up to 5V DC through the series resistor specified in the graph connected to a 5V power supply.

•Current Flow vs Charge Time (+20°C)

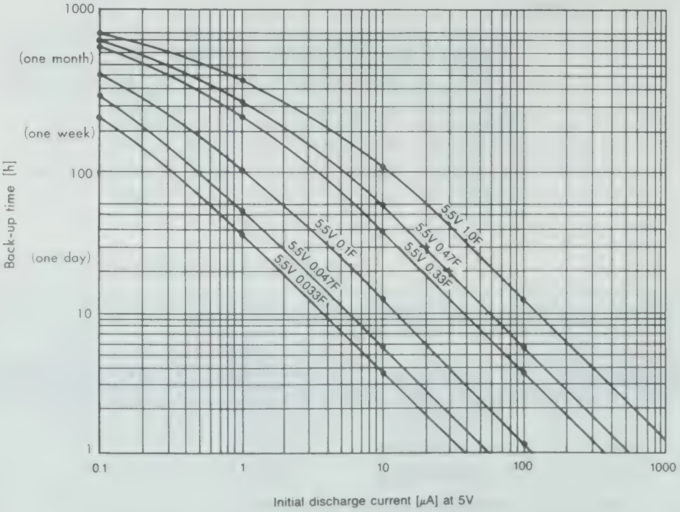
SG, NF Series



■ Holding Characteristics

•Discharge Current vs Back-up Time (+20°C)

SG, NF, F Series



The back-up time is defined as the time taken for the capacitor to discharge from 5VDC to 2VDC with a constant resistive load.

ECQ-V Series

This capacitor is constructed by stacking double side metallized polyester with a polycarbonate coating. Because of the mixed dielectric system and advanced mauufacturing techniques, the performance is excellent and the size is greatly reduced.

Features

- High volumetric efficiency
- Tight capacitance tolerance, ±5% (J)
- High stability
- Low dissipation factor
- Stacked and non-inductive construction
- Available for automatic insertion, up to 1.0μF (Not standard/upon request)

Applications

- Blocking, by-pass and coupling of DC and signals to VHF range
- Pulse, logic and timing circuit
- Light duty pulse forming network
- Filter and noise suppression circuit
- Suitable for replacement of monolithic ceramic capacitor

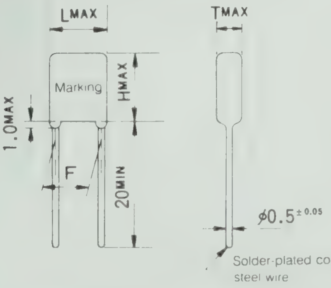
Specifications

Operating temperature range	−40～+85℃ (At +105℃ with 50% of rated voltage)
Rated voltage	DC 50V, DC 63V, DC 100V
Capacitance range	0.01～1.0μF
Capacitance tolerance	±5% (J)
Dissipation factor	≦1.0% (20℃, 1kHz)
Withstand voltage	Between terminals : rated voltage (V, DC)×150% 1minute
Insulation resistance	C≦0.33μF : ≧3000MΩ (20℃, DC 50V, 1minute) C>0.33μF : ≧1000MΩ.μF
Construction	Metallized polyestr film with polycarbonate coating, stacked construction, epoxy coating

Dimensions & Marking

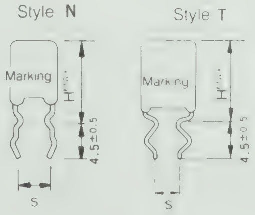
Standard

Type 1



Not Standard (upon request)

Type 2 (Suffix : W)



Marking (Example)

■ 50 VDC

Part Code	Capacitance (μF)	Dimensions (mm)						
		L MAX	T MAX	H MAX		F ±0.8	S ±0.8	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2	
ECQ V1H103JZ( )	.01	7.3	3.2	7.0	12.0	5.0	5.0	N
〃 1H123JZ( )	.012	〃	〃	〃	〃	〃	〃	〃
〃 1H153JZ( )	.015	〃	〃	〃	〃	〃	〃	〃
〃 1H183JZ( )	.018	〃	〃	〃	〃	〃	〃	〃
〃 1H223JZ( )	.022	〃	〃	〃	〃	〃	〃	〃
〃 1H273JZ( )	.027	〃	〃	〃	〃	〃	〃	〃
〃 1H333JZ( )	.033	〃	〃	〃	〃	〃	〃	〃
〃 1H393JZ( )	.039	〃	〃	〃	〃	〃	〃	〃
〃 1H473JZ( )	.047	〃	〃	〃	〃	〃	〃	〃
〃 1H563JZ( )	.056	〃	〃	〃	〃	〃	〃	〃
〃 1H683JZ( )	.068	〃	3.9	〃	〃	〃	〃	〃
〃 1H823JZ( )	.082	〃	4.1	〃	〃	〃	〃	〃
〃 1H104JZ( )	.1	〃	4.4	〃	〃	〃	〃	〃
〃 1H124JZ( )	.12	〃	4.7	〃	〃	〃	〃	〃
〃 1H154JZ( )	.15	10.0	3.4	9.0	14.0	7.5	〃	T
〃 1H184JZ( )	.18	〃	3.5	〃	〃	〃	〃	〃
〃 1H224JZ( )	.22	〃	3.7	〃	〃	〃	〃	〃
〃 1H274JZ( )	.27	〃	4.0	〃	〃	〃	〃	〃
〃 1H334JZ( )	.33	〃	4.2	〃	〃	〃	〃	〃
〃 1H394JZ( )	.39	〃	4.9	〃	〃	〃	〃	〃
〃 1H474JZ( )	.47	〃	5.5	10.0	15.0	〃	〃	〃
〃 1H564JZ( )	.56	〃	6.1	〃	〃	〃	〃	〃
〃 1H684JZ( )	.68	〃	6.8	〃	〃	〃	〃	〃
〃 1H824JZ( )	.82	〃	7.5	〃	〃	〃	〃	〃
〃 1H105JZ( )	1.0	〃	8.0	11.0	16.0	〃	〃	〃

↑ Suffix W for crimped lead as Type-2 or taped lead. (See page 133 for details) , Not standard

■ 63 VDC

Cart Code	Capacitance (μF)	Dimensions (mm)						
		L MAX	T MAX	H MAX		F ±0.8	S ±0.8	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2	
ECQ V1J103JZ( )	.01	7.3	3.2	7.0	12.0	5.0	5.0	N
〃 1J123JZ( )	.012	〃	〃	〃	〃	〃	〃	〃
〃 1J153JZ( )	.015	〃	〃	〃	〃	〃	〃	〃
〃 1J183JZ( )	.018	〃	〃	〃	〃	〃	〃	〃
〃 1J223JZ( )	.022	〃	〃	〃	〃	〃	〃	〃
〃 1J273JZ( )	.027	〃	〃	〃	〃	〃	〃	〃
〃 1J333JZ( )	.033	〃	〃	〃	〃	〃	〃	〃
〃 1J393JZ( )	.039	〃	〃	〃	〃	〃	〃	〃
〃 1J473JZ( )	.047	〃	〃	〃	〃	〃	〃	〃
〃 1J563JZ( )	.056	〃	〃	〃	〃	〃	〃	〃
〃 1J683JZ( )	.068	〃	3.9	〃	〃	〃	〃	〃
〃 1J823JZ( )	.082	〃	4.1	〃	〃	〃	〃	〃
〃 1J104JZ( )	.1	〃	4.4	〃	〃	〃	〃	〃
〃 1J124JZ( )	.12	〃	4.7	〃	〃	〃	〃	〃
〃 1J154JZ( )	.15	10.0	3.4	9.0	14.0	7.5	〃	T
〃 1J184JZ( )	.18	〃	3.5	〃	〃	〃	〃	〃
〃 1J224JZ( )	.22	〃	3.7	〃	〃	〃	〃	〃
〃 1J274JZ( )	.27	〃	4.0	〃	〃	〃	〃	〃
〃 1J334JZ( )	.33	〃	4.2	〃	〃	〃	〃	〃
〃 1J394JZ( )	.39	〃	4.9	〃	〃	〃	〃	〃
〃 1J474JZ( )	.47	〃	5.5	10.0	15.0	〃	〃	〃

↑ Suffix W for crimped lead as Type-2 or taped lead. (See page 133 for details), Not standard

Cart Code	Capacitance (μF)	Dimensions (mm)						
		LMAX	TMAX	HMAX		F ±0.8	S ±0.8	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2	
ECQ V1J564JZ( )	.56	10.0	6.1	10.0	15.0	7.5	5.0	T
〃 1J684JZ( )	.68	〃	6.8	〃	〃	〃	〃	〃
〃 1J824JZ( )	.82	〃	8.0	14.0	18.0	〃	〃	〃
〃 1J105JZ( )	1.0	〃	9.0	〃	〃	〃	〃	〃

↑ Suffix W for crimped lead as Type-2 or taped lead. (See page 133 for details), Not standard

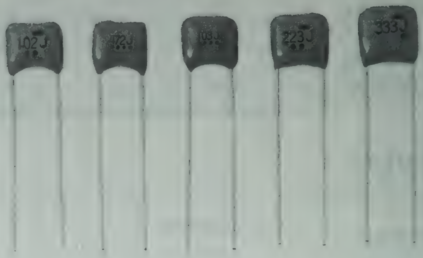
■ 100 VDC

Part Code	Capacitance (μF)	Dimensions (mm)						
		L^{MAX}	T^{MAX}	H^{MAX}		F ±0.8	S ±0.8	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2	
ECQ V1103JZ( )	.01	7.3	3.2	7.0	12.0	5.0	5.0	N
1123JZ( )	.012	〃	〃	〃	〃	〃	〃	〃
1153JZ( )	.015	〃	〃	〃	〃	〃	〃	〃
1183JZ( )	.018	〃	〃	〃	〃	〃	〃	〃
1223JZ( )	.022	〃	〃	〃	〃	〃	〃	〃
1273JZ( )	.027	〃	〃	〃	〃	〃	〃	〃
1333JZ( )	.033	〃	〃	〃	〃	〃	〃	〃
1393JZ( )	.039	〃	〃	〃	〃	〃	〃	〃
1473JZ( )	.047	〃	4.0	〃	〃	〃	〃	〃
1563JZ( )	.056	〃	4.2	〃	〃	〃	〃	〃
1683JZ( )	.068	〃	4.5	〃	〃	〃	〃	〃
1823JZ( )	.082	〃	5.0	〃	〃	〃	〃	〃
1104JZ( )	.1	〃	5.8	〃	〃	〃	〃	〃
1124JZ( )	.12	10.0	3.4	9.0	14.0	7.5	〃	T
1154JZ( )	.15	〃	3.8	〃	〃	〃	〃	〃
1184JZ( )	.18	〃	4.0	〃	〃	〃	〃	〃
1224JZ( )	.22	〃	4.3	〃	〃	〃	〃	〃
1274JZ( )	.27	〃	5.2	10.0	15.0	〃	〃	〃
1334JZ( )	.33	〃	5.9	〃	〃	〃	〃	〃
1394JZ( )	.39	〃	7.5	11.0	16.0	〃	〃	〃
1474JZ( )	.47	〃	8.1	〃	〃	〃	〃	〃

↑ Suffix W for crimped lead as Type-2 or taped lead. (See page 133 for details), Not standard

ECQ-B(F) Series

This series is especially designed for application where high density insertion of components is required.



Features

- High volumetric efficiency
- Non-inductive construction
- Low-loss, high stability
- Epoxy resin coating
- Available for automatic insertion
  (Not standard /upon raquest)

Applications

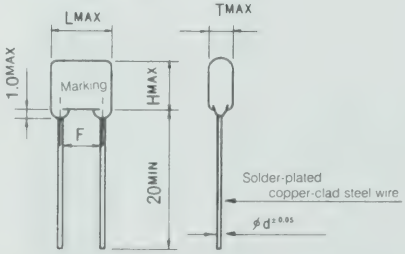
- Blocking, by-pass and coupling of DC and signal to VHF range
- Pulse, logic and timing circuits
- Light duty pulse forming networks
- Filter and noise suppression circuits
- General purpose usage

Specifications

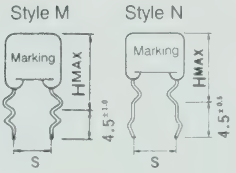
Operating temperature range	−40～+85°C (At +105°C with 50% of rated voltage)
Rated voltage	DC 50V
Capacitance range	0.0001～0.01μF
Capacitance tolerance	±5% (J)
Dissipation factor	≦1.0% (20°C, 1 kHz)
Withstand voltage	Between terminals: rated voltage (V, DC)×250% 1～5 sec.
Insulation resistance	≧30000 MΩ (20°C, DC 100 V, 1 minute)
Construction	Polyester film, non-inductive, epoxy coating

Dimensions & Marking

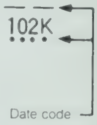
Standard
TYPE-1



Not Standard (upon request)
TYPE-2 (Suffix : W)



Marking (Example)

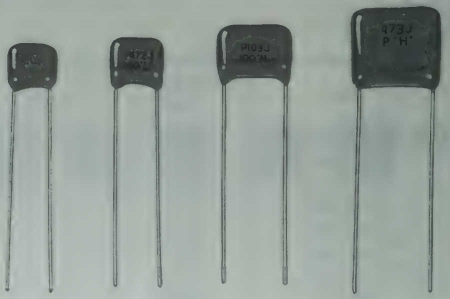


■ 50 VDC

Part Code	Capacitance (μF)	Dimensions(mm)							
		L^{MAX}	L^{MAX}	H^{MAX}		$F^{+0.75}_{0.25}$	S±0.8	ϕd ±0.05	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2		
ECQ B1H101KF( )	.0001	6.5	3.0	5.5	10.5	5.0	5.0	0.5	N
〃 1H121KF( )	.00012	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H151KF( )	.00015	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H181KF( )	.00018	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H221KF( )	.00022	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H271KF( )	.00027	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H331KF( )	.00033	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H391KF( )	.00039	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H471JF( )	.00047	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H561JF( )	.00056	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H681JF( )	.00068	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H821JF( )	.00082	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H102JF( )	.001	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H122JF( )	.0012	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H152JF( )	.0015	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H182JF( )	.0018	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H222JF( )	.0022	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H272JF( )	.0027	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H332JF( )	.0033	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H392JF( )	.0039	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H472JF( )	.0047	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H562JF( )	.0056	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H682JF( )	.0068	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H822JF( )	.0082	〃	〃	〃	〃	〃	〃	〃	〃

↑ Suffix W for crimped lead as type-2 or taped lead. (See page 133 for details), Not standard

ECQ-P Series



This series is designed for applications where tight capacitance tolerance is required, and is an ideal replacement for polystylene capacitor because of lenear negative temperature coefficient, excellent frequency characteristics and low dissipation factor.

Features

- Wide capacitance range
- Tight capacitance tolerance
- High insulation resistance
- Low dissipation factor
- Non-inductive construction
- Epoxy resin coating
- Available for automatic insertion (Not standard /upon request)

Applications

- Blocking, by-pass and coupling of DC and signal to UHF range
- Pulse, logic and timing circuit
- Light duty pulse forming network
- Filter and noise suppression circuit
- General purpose usage

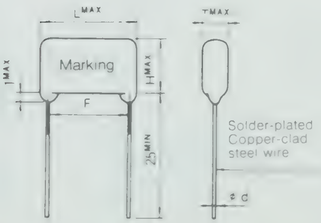
Specifications

Operating temperature range.	−40～+85℃
Rated voltage	DC 50V
Capacitance range	0.001～0.47μ
Capacitance tolerance	±5%(J),±2%(G) 〔(±1% (F) upon request), Not standard〕
Dissipation factor	0.1% Max. (20℃, 1kHz)
Withstand voltage	Between terminals : rated volt. (V. DC)×250% 1～5sec
Insulation resistance	C≦0.33μF : 45,000MΩ Min C>0.33μF : 14,000MΩ·μF Min 20℃ Rated volt. 1minute
Construction	Polypropylene film, non-inductive, epoxy resin coating

Dimensions & Marking

Standard

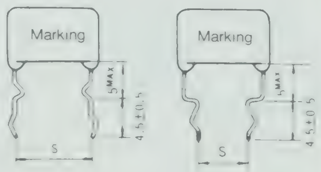
TYPE-1



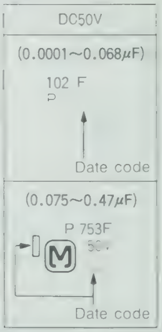
Not Standard (upon request)

TYPE-2 (Suffix W)

Style N　Style T



Marking example



■ 50 VDC

Part Code	Capacitance (μF)	Dimensions(mm)							
		L^{MAX}	T^{MAX}	H^{MAX}		F±1.25	S±0.8	φd	Crimped Style
				TYPE-1	TYPE-2	TYPE-1	TYPE-2	±0.05	
ECQ P1H102( )Z( )	.001	8.5	4.5	7.5	12.5	5.0	5.0	0.5	N
〃 1H122( )Z( )	.0012	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H152( )Z( )	.0015	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H182( )Z( )	.0018	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H222( )Z( )	.0022	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H272( )Z( )	.0027	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H332( )Z( )	.0033	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H392( )Z( )	.0039	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H472( )Z( )	.0047	〃	〃	〃	〃	〃	〃	〃	〃
〃 1H562( )Z( )	.0056	〃	〃	8.0	13.0	〃	〃	〃	〃
〃 1H682( )Z( )	.0068	〃	5.0	〃	〃	〃	〃	〃	〃
〃 1H822( )Z( )	.0082	12.0	5.5	9.0	14.0	7.5	〃	0.6	T
〃 1H103( )Z( )	.01	〃	5.0	8.5	13.5	〃	〃	〃	〃
〃 1H123( )Z( )	.012	〃	5.5	9.0	14.0	〃	〃	〃	〃
〃 1H153( )Z( )	.015	〃	5.0	〃	〃	〃	〃	〃	〃
〃 1H183( )Z( )	.018	〃	〃	9.5	14.5	〃	〃	〃	〃
〃 1H223( )Z( )	.022	〃	〃	10.5	15.5	〃	〃	〃	〃
〃 1H273( )Z( )	.027	〃	6.0	11.0	16.0	〃	〃	〃	〃
〃 1H333( )Z( )	.033	〃	6.5	11.5	16.5	〃	〃	〃	〃
〃 1H393( )Z( )	.039	14.5	5.5	12.0	17.0	10.0	〃	〃	〃
〃 1H473( )Z( )	.047	〃	6.0	12.5	17.5	〃	〃	〃	〃
〃 1H563( )Z( )	.056	〃	6.5	13.5	18.5	〃	〃	〃	〃
〃 1H683( )Z( )	.068	〃	7.0	14.0	19.0	〃	〃	〃	〃
〃 1H823( )Z( )	.082	17.0	〃	〃	〃	12.5	7.5	〃	〃
〃 1H104( )Z( )	.1	〃	7.5	14.5	19.5	〃	〃	〃	〃
〃 1H124( )Z( )	.12	〃	8.5	15.5	20.5	〃	〃	〃	〃
〃 1H154( )Z( )	.15	20.0	8.0	〃	〃	15.0	10.0	〃	〃
〃 1H184( )Z( )	.18	〃	9.0	16.0	21.0	〃	〃	〃	〃
〃 1H224( )Z( )	.22	〃	9.5	17.0	22.0	〃	〃	〃	〃
〃 1H274( )Z( )	.27	〃	10.5	18.0	23.0	〃	〃	〃	〃
〃 1H334( )Z( )	.33	22.5	10.0	19.5	24.5	17.5	12.5	0.8	〃
〃 1H394( )Z( )	.39	〃	11.0	20.0	25.0	〃	〃	〃	〃
〃 1H474( )Z( )	.47	〃	12.0	21.0	26.0	〃	〃	〃	〃

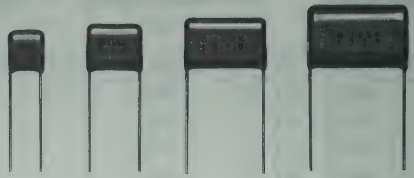
Suffix W for crimped lead as Type-2 or taped lead. (See page 133 for details)

Capacitance tolerance Code G(±2%) or J(±5%)

(Note) Other capacitance Value upon request

ECQ-E Series

The type ECQ-E series is using a dual side metallized polyester film with high dielectric constant (ε) which makes it possible to produce large C-values in small dimensions, and is economical capacitor meeting high requirements for professional circuit design.



Features

- Self-healing property
- Flame retardant epoxy resin coating
- Available for wide automatic insertion range (Not standard/upon request)
- Excellent high frequency characteristics

Applications

- Blocking, by-pass and coupling of DC and signals to VHF range
- Pulse, logic and timing circuit
- Filter and noise suppression circuit
- General purpose usage in both consumer and industrial equipment.

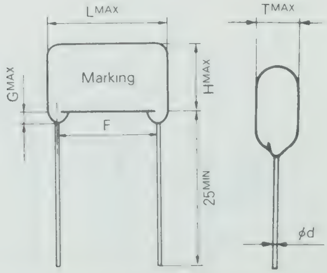
Specifications

Operating temp. range	−40〜+85℃ (At +105℃ with 75% of rated voltage)	
Rated voltage	DC 100V, 250V, 400V, 630V,	
Capacitance range	0.001〜10μF	
Capacitance tolerance	±10%(K) 〔(±5% (J) upon request), Not standard〕	
Dissipation factor	≦1.0% (20℃, 1kHz)	
Withstand voltage	Between terminals : rated voltage (V DC)×150% 1minute	
Isulation resistance	C≦0.33μF : ≧9000MΩ C>0.33μF : ≧3000MΩ·μF (20℃, DC 100V, 1minute)	
Construction	Metallized polyester film, flame retardant epoxy coating	
Lead material	Solder-plated copper wire	100VDC, 250VDC
	Solder-plated copper-clad steel wire	400VDC, 630VDC,

Dimensions

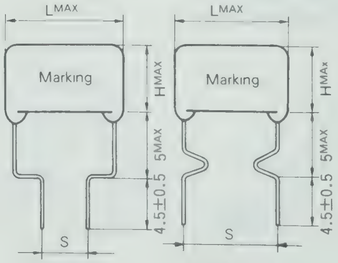
Standard

TYPE-1



Not Standard (upon request)

TYPE-2(Suffix : B)



(Style B) (Style D)

100VDC Series

■ TYPE-Z

Part code	Capacitance (μF)	Dimensions(mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±0.75 TYPE-1	S±0.8 TYPE-2	G^{MAX} TYPE-1	φd±0.05	TYPE-2 Style
ECQ E1104KZ( )	0.1	12.0	4.0	7.5	10.0	5.0	1.0	0.6	B
〃 1124KZ( )	0.12	〃	4.5	〃	〃	〃	〃	〃	〃
〃 1154KZ( )	0.15	〃	4.0	9.5	〃	〃	〃	〃	〃
〃 1184KZ( )	0.18	〃	4.5	10.0	〃	〃	〃	〃	〃
〃 1224KZ( )	0.22	〃	5.0	10.5	〃	〃	〃	〃	〃
〃 1274KZ( )	0.27	17.0	4.5	8.0	15.0	10.0	〃	〃	〃
〃 1334KZ( )	0.33	〃	〃	10.0	〃	〃	〃	〃	〃
〃 1394KZ( )	0.39	〃	5.0	〃	〃	〃	〃	〃	〃
〃 1474KZ( )	0.47	〃	5.5	11.0	〃	〃	〃	〃	〃
〃 1564KZ( )	0.56	〃	6.5	11.5	〃	〃	〃	0.8	〃
〃 1684KZ( )	0.68	〃	7.0	12.0	〃	〃	〃	〃	〃
〃 1824KZ( )	0.82	〃	7.5	13.0	〃	〃	〃	〃	〃
〃 1105KZ( )	1.0	〃	8.0	14.0	〃	〃	〃	〃	〃
〃 1125KZ( )	1.2	〃	8.5	16.0	〃	〃	〃	〃	〃
〃 1155KZ( )	1.5	25.5	7.5	14.5	22.5	15.0	〃	〃	〃
〃 1185KZ( )	1.8	〃	8.5	16.0	〃	〃	〃	〃	〃
〃 1225KZ( )	2.2	〃	9.5	16.5	〃	〃	〃	〃	〃
〃 1275KZ( )	2.7	〃	10.0	18.5	〃	〃	〃	〃	〃
〃 1335KZ( )	3.3	〃	〃	19.0	〃	〃	〃	〃	〃
〃 1395KZ( )	3.9	30.5	11.0	18.0	27.5	20.0	1.5	〃	〃
〃 1475KZ( )	4.7	〃	〃	20.5	〃	〃	〃	〃	〃
〃 1565KZ( )	5.6	〃	12.5	21.0	〃	〃	〃	〃	〃
〃 1685KZ( )	6.8	〃	13.0	24.0	〃	〃	〃	〃	〃
〃 1825KZ( )	8.2	〃	15.0	25.0	〃	〃	〃	〃	〃
〃 1106KZ( )	10.0	〃	16.0	27.0	〃	〃	〃	〃	〃

Suffix "B" for Crimped lead as type-2 (Not standard)

■ TYPE-F (NEW MINI-DIP)

Part code	Capacitance (μF)	Dimensions (mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.0 TYPE-1	S±0.8 TYPE-2	G^{MAX} TYPE-1	φd±0.05	TYPE-2 Style
ECQ E1103KF ( )	0.01	7.8	4.6	7.7	5.0	5.0	1.0	0.5	D
〃 1123KF ( )	0.012	〃	4.5	7.6	〃	〃	〃	〃	〃
〃 1153KF ( )	0.015	〃	〃	〃	〃	〃	〃	〃	〃
〃 1183KF ( )	0.018	〃	4.6	7.7	〃	〃	〃	〃	〃
〃 1223KF ( )	0.022	〃	4.9	8.0	〃	〃	〃	〃	〃
〃 1273KF ( )	0.027	〃	4.7	7.8	〃	〃	〃	〃	〃
〃 1333KF ( )	0.033	〃	4.6	7.7	〃	〃	〃	〃	〃
〃 1393KF ( )	0.039	〃	4.9	8.0	〃	〃	〃	〃	〃
〃 1473KF ( )	0.047	〃	4.5	7.5	〃	〃	〃	〃	〃
〃 1563KF ( )	0.056	〃	4.8	7.9	〃	〃	〃	〃	〃
〃 1683KF ( )	0.068	〃	〃	〃	〃	〃	〃	〃	〃
〃 1823KF ( )	0.082	〃	4.7	9.9	〃	〃	〃	〃	〃
〃 1104KF ( )	0.1	〃	5.0	10.0	〃	〃	〃	〃	〃
〃 1124KF ( )	0.12	10.3	4.5	7.5	7.5	7.5	〃	0.6	〃
〃 1154KF ( )	0.15	〃	〃	〃	〃	〃	〃	〃	〃
〃 1184KF ( )	0.18	〃	4.8	7.9	〃	〃	〃	〃	〃
〃 1224KF ( )	0.22	〃	5.0	8.0	〃	〃	〃	〃	〃
〃 1274KF ( )	0.27	〃	4.5	12.0	〃	〃	〃	〃	〃
〃 1334KF ( )	0.33	〃	6.0	10.7	〃	〃	〃	〃	〃
〃 1394KF ( )	0.39	〃	6.3	11.0	〃	〃	〃	〃	〃
〃 1474KF ( )	0.47	〃	6.0	12.0	〃	〃	〃	〃	〃
〃 1564KF ( )	0.56	12.0	5.5	10.9	10.0	10.0	〃	〃	〃
〃 1684KF ( )	0.68	〃	6.0	11.9	〃	〃	〃	〃	〃
〃 1824KF ( )	0.82	〃	〃	13.5	〃	〃	〃	〃	〃
〃 1105KF ( )	1.0	〃	6.7	14.0	〃	〃	〃	〃	〃
〃 1125KF ( )	1.2	18.5	5.5	12.8	15.0	〃	〃	〃	B
〃 1155KF ( )	1.5	〃	6.0	13.4	〃	〃	〃	0.8	〃
〃 1185KF ( )	1.8	〃	6.5	14.4	〃	〃	〃	〃	〃
〃 1225KF ( )	2.2	〃	7.0	15.0	〃	〃	〃	〃	〃
〃 1275KF ( )	2.7	〃	8.0	15.8	〃	〃	〃	〃	〃
〃 1335KF ( )	3.3	〃	8.5	16.5	〃	〃	〃	〃	〃
〃 1395KF ( )	3.9	26.0	7.0	16.4	22.5	15.0	〃	〃	〃
〃 1475KF ( )	4.7	〃	7.5	17.0	〃	〃	〃	〃	〃
〃 1565KF ( )	5.6	〃	8.3	17.5	〃	〃	〃	〃	〃
〃 1685KF ( )	6.8	〃	9.0	18.5	〃	〃	〃	〃	〃
〃 1825KF ( )	8.2	〃	10.0	20.0	〃	〃	1.5	〃	〃
〃 1106KF ( )	10.0	〃	11.5	21.0	〃	〃	〃	〃	〃

Suffix "B" for Crimped lead as Type-2. Not standard

250VDC Series

■TYPE-S

Part code	Capacitance (μF)	Dimensions (mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±0.75	S±0.8	G^{MAX}	φd±0.05	TYPE-2 Style
					TYPE-1	TYPE-2	TYPE-1		
ECQ E2103KS( )	.01	12.5	5.0	8.0	10.0	7.5	1.0	0.6	B
〃 2123KS( )	.012	〃	4.5	〃	〃	〃	〃	〃	〃
〃 2153KS( )	.015	〃	5.0	〃	〃	〃	〃	〃	〃
〃 2183KS( )	.018	〃	4.5	〃	〃	〃	〃	〃	〃
〃 2223KS( )	.022	〃	〃	〃	〃	〃	〃	〃	〃
〃 2273KS( )	.027	〃	5.0	〃	〃	〃	〃	〃	〃
〃 2333KS( )	.033	〃	4.5	〃	〃	〃	〃	〃	〃
〃 2393KS( )	.039	〃	5.0	〃	〃	〃	〃	〃	〃
〃 2473KS( )	.047	〃	4.5	7.5	〃	〃	〃	〃	〃
〃 2563KS( )	.056	〃	5.0	8.0	〃	〃	〃	〃	〃
〃 2683KS( )	.068	〃	〃	〃	〃	〃	〃	〃	〃
〃 2823KS( )	.082	〃	〃	10.0	〃	〃	〃	〃	〃
〃 2104KS( )	.1	〃	〃	10.5	〃	〃	〃	〃	〃
〃 2124KS( )	.12	17.5	〃	10.0	15.0	〃	〃	0.8	〃
〃 2154KS( )	.15	〃	5.5	10.5	〃	〃	〃	〃	〃
〃 2184KS( )	.18	〃	〃	〃	〃	10.0	〃	〃	〃
〃 2224KS( )	.22	〃	〃	11.0	〃	〃	〃	〃	〃
〃 2274KS( )	.27	23.0	〃	10.5	20.0	〃	〃	〃	〃
〃 2334KS( )	.33	〃	〃	11.0	〃	〃	〃	〃	〃
〃 2394KS( )	.39	〃	6.0	11.5	〃	12.5	〃	〃	〃
〃 2474KS( )	.47	〃	6.5	12.0	〃	〃	〃	〃	〃
〃 2564KS( )	.56	〃	7.0	12.5	〃	〃	〃	〃	〃
〃 2684KS( )	.68	〃	7.5	13.5	〃	〃	〃	〃	〃
〃 2824KS( )	.82	31.0	7.0	12.5	27.5	17.5	〃	〃	〃
〃 2105KS( )	1.0	〃	7.5	13.5	〃	〃	〃	〃	〃
〃 2125KS( )	1.2	〃	〃	15.5	〃	〃	〃	〃	〃
〃 2155KS( )	1.5	〃	8.5	16.5	〃	〃	〃	〃	〃
〃 2185KS( )	1.8	〃	〃	18.0	〃	〃	〃	〃	〃
〃 2225KS( )	2.2	〃	9.5	19.5	〃	〃	〃	〃	〃
〃 2275KS( )	2.7	〃	11.0	20.5	〃	〃	1.5	〃	〃
〃 2335KS( )	3.3	〃	12.5	22.0	〃	〃	〃	〃	〃
〃 2395KS( )	3.9	〃	13.5	23.0	〃	〃	〃	〃	〃
〃 2475KS( )	4.7	〃	15.0	24.5	〃	〃	〃	〃	〃
〃 2565KS( )	5.6	42.5	14.0	23.0	38.5	30.0	〃	〃	〃
〃 2685KS( )	6.8	〃	15.5	25.0	〃	〃	〃	〃	〃
〃 2825KS( )	8.2	〃	17.0	27.0	〃	〃	〃	1.0	〃
〃 2106KS( )	10.0	〃	19.5	29.0	〃	〃	〃	〃	〃

Suffix "B" for Crimped lead as Type-2. Not standard

■ TYPE-F (NEW MINI-DIP)

Part code	Capacitance (μF)	Dimensions (mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.0 TYPE-1	S±0.8 TYPE-2	G^{MAX} TYPE-1	φd±0.05	TYPE-2 Style
ECQ E2103KF ( )	.01	10.3	4.3	7.4	7.5	7.5	1.0	0.6	D
〃 2123KF ( )	.012	〃	4.4	7.5	〃	〃	〃	〃	〃
〃 2153KF ( )	.015	〃	〃	〃	〃	〃	〃	〃	〃
〃 2183KF ( )	.018	〃	〃	〃	〃	〃	〃	〃	〃
〃 2223KF ( )	.022	〃	〃	〃	〃	〃	〃	〃	〃
〃 2273KF ( )	.027	〃	〃	〃	〃	〃	〃	〃	〃
〃 2333KF ( )	.033	〃	4.5	〃	〃	〃	〃	〃	〃
〃 2393KF ( )	.039	〃	〃	〃	〃	〃	〃	〃	〃
〃 2473KF ( )	.047	〃	〃	〃	〃	〃	〃	〃	〃
〃 2563KF ( )	.056	〃	4.8	7.9	〃	〃	〃	〃	〃
〃 2683KF ( )	.068	〃	4.5	7.5	〃	〃	〃	〃	〃
〃 2823KF ( )	.082	〃	4.9	8.0	〃	〃	〃	〃	〃
〃 2104KF ( )	.1	〃	5.8	8.4	〃	〃	〃	〃	〃
〃 2124KF ( )	.12	〃	6.0	9.0	〃	〃	〃	〃	〃
〃 2154KF ( )	.15	〃	〃	10.8	〃	〃	〃	〃	〃
〃 2184KF ( )	.18	12.0	5.0	10.3	10.0	10.0	〃	〃	〃
〃 2224KF ( )	.22	〃	5.5	10.5	〃	〃	〃	〃	〃
〃 2274KF ( )	.27	〃	6.0	11.5	〃	〃	〃	〃	〃
〃 2334KF ( )	.33	〃	6.5	12.0	〃	〃	〃	〃	〃
〃 2394KF ( )	.39	18.5	4.9	〃	15.0	〃	〃	〃	B
〃 2474KF ( )	.47	〃	5.3	12.5	〃	〃	〃	〃	〃
〃 2564KF ( )	.56	〃	5.5	13.0	〃	〃	〃	〃	〃
〃 2684KF ( )	.68	〃	6.0	13.5	〃	〃	〃	0.8	〃
〃 2824KF ( )	.82	〃	6.5	14.5	〃	〃	〃	〃	〃
〃 2105KF ( )	1.0	〃	7.4	15.0	〃	〃	〃	〃	〃
〃 2125KF ( )	1.2	〃	8.0	15.9	〃	〃	〃	〃	〃
〃 2155KF ( )	1.5	〃	9.0	16.8	〃	〃	〃	〃	〃
〃 2185KF ( )	1.8	26.0	7.5	15.5	22.5	15.0	〃	〃	〃
〃 2225KF ( )	2.2	〃	8.5	16.3	〃	〃	〃	〃	〃
〃 2275KF ( )	2.7	〃	9.4	17.0	〃	〃	〃	〃	〃
〃 2335KF ( )	3.3	〃	10.3	18.0	〃	〃	1.5	〃	〃
〃 2395KF ( )	3.9	〃	11.0	20.5	〃	〃	〃	〃	〃
〃 2475KF ( )	4.7	〃	12.0	21.5	〃	〃	〃	〃	〃
〃 2565KF ( )	5.6	31.0	11.8	21.0	27.5	22.5	〃	〃	〃
〃 2685KF ( )	6.8	〃	13.0	22.4	〃	〃	〃	〃	〃
〃 2825KF ( )	8.2	〃	14.3	23.5	〃	〃	〃	〃	〃
〃 2106KF ( )	10.0	〃	15.9	25.8	〃	〃	〃	〃	〃

↑ Suffix "B" for Crimped lead as Type-2. Not standard

400VDC Series

■ TYPE-Z

Part code	Capacitance (μF)	Dimensions (mm)							
		C^{MAX}	T^{MAX}	H^{MAX}	F±1.25	S±0.8	G^{MAX}	ϕd±0.05	TYPE-2 Style
					TYPE-1	TYPE-2	TYPE-1		
ECQ E4103 KZ ( )	.01	13.5	4.5	8.0	10.5	7.5	1.0	0.6	B
〃 4123 KZ ( )	.012	〃	5.0	〃	〃	〃	〃	〃	〃
〃 4153 KZ ( )	.015	〃	4.5	〃	〃	〃	〃	〃	〃
〃 4183 KZ ( )	.018	〃	5.0	〃	〃	〃	〃	〃	〃
〃 4223 KZ ( )	.022	〃	〃	10.0	〃	〃	〃	〃	〃
〃 4273 KZ ( )	.027	〃	〃	10.5	〃	〃	〃	〃	〃
〃 4333 KZ ( )	.033	〃	5.5	11.0	〃	〃	〃	〃	〃
〃 4393 KZ ( )	.039	〃	6.0	11.5	〃	〃	〃	〃	〃
〃 4473 KZ ( )	.047	〃	6.5	12.0	〃	〃	〃	〃	〃
〃 4563 KZ ( )	.056	16.5	6.0	11.0	13.5	10.0	〃	〃	〃
〃 4683 KZ ( )	.068	〃	6.5	12.0	〃	〃	〃	〃	〃
〃 4823 KZ ( )	.082	〃	7.0	12.5	〃	〃	〃	〃	〃
〃 4104 KZ ( )	.111	〃	〃	14.5	〃	〃	〃	〃	〃
〃 4124 KZ ( )	.12	〃	7.5	15.0	〃	〃	〃	〃	〃
〃 4154 KZ ( )	.15	〃	8.0	16.0	〃	〃	〃	0.8	〃
〃 4184 KZ ( )	.18	〃	9.0	16.5	〃	〃	〃	〃	〃
〃 4224 KZ ( )	.22	24.0	7.5	15.0	20.5	12.5	〃	〃	〃
〃 4274 KZ ( )	.27	〃	8.0	16.0	〃	〃	〃	〃	〃
〃 4334 KZ ( )	.33	〃	9.0	16.5	〃	〃	〃	〃	〃
〃 4394 KZ ( )	.39	29.0	8.5	16.0	25.5	17.5	1.5	〃	〃
〃 4474 KZ ( )	.47	〃	9.0	17.0	〃	〃	〃	〃	〃
〃 4564 KZ ( )	.56	〃	10.0	17.5	〃	〃	〃	〃	〃
〃 4684 KZ ( )	.68	〃	11.5	18.5	〃	〃	〃	〃	〃
〃 4824 KZ ( )	.82	〃	12.5	20.5	〃	〃	〃	〃	〃
〃 4105 KZ ( )	1.0	〃	14.0	21.5	〃	〃	〃	〃	〃
〃 4125 KZ ( )	1.2	〃	14.5	24.0	〃	〃	〃	〃	〃
〃 4155 KZ ( )	1.5	42.5	12.5	22.0	38.5	27.5	〃	〃	〃
〃 4185 KZ ( )	1.8	〃	13.5	23.0	〃	〃	〃	〃	〃
〃 4225 KZ ( )	2.2	〃	15.0	24.5	〃	〃	〃	〃	〃

↑ Suffix "B" for Crimped lead as Type-2. Not standard

■ TYPE-F (NEW MINI-DIP)

Part code	Capacitance (μF)	Dimensions (mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.0	S±0.8	G^{MAX}	φd±0.05	TYPE-2 Style
					TYPE-1	TYPE-2	TYPE-1		
ECQ E4103KF ( )	.01	10.3	4.3	7.4	7.5	7.5	1.0	0.6	D
〃 4123KF ( )	.012	〃	4.4	7.5	〃	〃	〃	〃	〃
〃 4153KF ( )	.015	〃	〃	〃	〃	〃	〃	〃	〃
〃 4183KF ( )	.018	〃	〃	〃	〃	〃	〃	〃	〃
〃 4223KF ( )	.022	〃	4.8	7.9	〃	〃	〃	〃	〃
〃 4273KF ( )	.027	〃	5.5	8.0	〃	〃	〃	〃	〃
〃 4333KF ( )	.033	〃	6.0	9.0	〃	〃	〃	〃	〃
〃 4393KF ( )	.039	12.0	4.9	8.0	10.0	10.0	〃	〃	〃
〃 4473KF ( )	.047	〃	5.0	8.3	〃	〃	〃	〃	〃
〃 4563KF ( )	.056	〃	〃	10.0	〃	〃	〃	〃	〃
〃 4683KF ( )	.068	〃	5.4	10.5	〃	〃	〃	〃	〃
〃 4823KF ( )	.082	〃	5.8	11.0	〃	〃	〃	〃	〃
〃 4104KF ( )	.11	〃	6.3	12.0	〃	〃	〃	〃	〃
〃 4124KF ( )	.12	18.5	5.0	10.0	15.0	〃	〃	〃	B
〃 4154KF ( )	.15	〃	〃	12.4	〃	〃	〃	〃	〃
〃 4184KF ( )	.18	〃	5.4	12.5	〃	〃	〃	〃	〃
〃 4224KF ( )	.22	〃	5.9	13.0	〃	〃	〃	〃	〃
〃 4274KF ( )	.27	〃	6.5	14.3	〃	〃	〃	0.8	〃
〃 4334KF ( )	.33	〃	7.0	14.9	〃	〃	〃	〃	〃
〃 4394KF ( )	.39	〃	7.5	15.4	〃	〃	〃	〃	〃
〃 4474KF ( )	.47	〃	7.8	17.0	〃	〃	〃	〃	〃
〃 4564KF ( )	.56	26.0	6.5	16.0	22.5	15.0	〃	〃	〃
〃 4684KF ( )	.68	〃	7.0	16.5	〃	〃	〃	〃	〃
〃 4824KF ( )	.82	〃	7.9	17.3	〃	〃	〃	〃	〃
〃 4105KF ( )	1.0	〃	8.5	18.0	〃	〃	〃	〃	〃
〃 4125KF ( )	1.2	〃	9.5	18.9	〃	〃	〃	〃	〃
〃 4155KF ( )	1.5	31.0	〃	19.0	27.5	22.5	〃	〃	〃
〃 4185KF ( )	1.8	〃	11.0	20.5	〃	〃	1.5	〃	〃
〃 4225KF ( )	2.2	〃	〃	22.0	〃	〃	〃	〃	〃

↑ Suffix "B" for Crimped lead as Type-2. Not standard

630 VDC Series

■ TYPE-Z

Part code	Capacitance (μF)	Dimensions(mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.25	S±0.8	G^{MAX}	φd±0.05	TYPE-2 Style
					TYPE-1	TYPE-2	TYPE-1		
ECQ E6103KZ( )	.01	13.5	5.0	8.0	10.5	7.5	1.0	0.6	B
〃 6123KZ( )	.012	〃	〃	10.0	〃	〃	〃	〃	〃
〃 6153KZ( )	.015	〃	5.5	10.5	〃	〃	〃	〃	〃
〃 6183KZ( )	.018	〃	〃	11.0	〃	〃	〃	〃	〃
〃 6223KZ( )	.022	〃	6.0	12.0	〃	〃	〃	〃	〃
〃 6273KZ( )	.027	16.5	5.0	12.5	13.5	10.0	〃	〃	〃
〃 6333KZ( )	.033	〃	5.5	12.0	〃	〃	〃	〃	〃
〃 6393KZ( )	.039	〃	6.0	〃	〃	〃	〃	〃	〃
〃 6473KZ( )	.047	〃	6.5	13.5	〃	〃	〃	〃	〃
〃 6563KZ( )	.056	〃	7.0	14.0	〃	〃	〃	〃	〃
〃 6683KZ( )	.068	〃	7.5	15.0	〃	〃	〃	〃	〃
〃 6823KZ( )	.082	〃	8.0	16.0	〃	〃	〃	0.8	〃
〃 6104KZ( )	.1	24.0	6.5	14.0	20.5	12.5	1.5	〃	〃
〃 6124KZ( )	.12	〃	7.5	15.0	〃	〃	〃	〃	〃
〃 6154KZ( )	.15	〃	8.0	16.0	〃	〃	〃	〃	〃
〃 6184KZ( )	.18	〃	9.0	16.5	〃	〃	〃	〃	〃
〃 6224KZ( )	.22	29.0	8.5	〃	25.5	17.5	〃	〃	〃
〃 6274KZ( )	.27	〃	9.5	17.0	〃	〃	〃	〃	〃
〃 6334KZ( )	.33	〃	10.5	18.0	〃	〃	〃	〃	〃
〃 6394KZ( )	.39	〃	11.5	19.0	〃	〃	〃	〃	〃
〃 6474KZ( )	.47	〃	12.5	20.5	〃	〃	〃	〃	〃
〃 6564KZ( )	.56	〃	14.0	21.5	〃	〃	〃	〃	〃
〃 6684KZ( )	.68	42.5	12.0	19.5	38.5	27.5	〃	〃	〃
〃 6824KZ( )	.82	〃	13.0	21.0	〃	〃	〃	〃	〃
〃 6105KZ( )	1.0	〃	13.5	23.0	〃	〃	〃	〃	〃
〃 6125KZ( )	1.2	〃	15.0	24.5	〃	〃	〃	〃	〃
〃 6155KZ( )	1.5	〃	17.0	27.0	〃	〃	〃	〃	〃
〃 6185KZ( )	1.8	〃	19.5	29.0	〃	〃	〃	1.0	〃
〃 6225KZ( )	2.2	〃	20.5	32.0	〃	〃	〃	〃	〃

Suffix "B" for Crimped as Type-2. Not standard

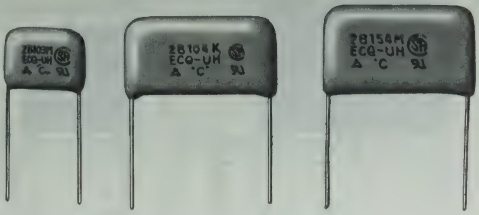
■ TYPE-F (NEW MINI-DIP)

Part code	Capacitance (μF)	Dimensions (mm)							
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.0 TYPE-1	S±0.8 TYPE-2	G^{MAX} TYPE-1	φd±0.05	TYPE-2 Style
ECQ E6103 KF ( )	.01	12.0	4.5	7.5	10.0	10.0	1.0	0.6	D
〃 6123 KF ( )	.012	〃	〃	7.8	〃	〃	〃	〃	〃
〃 6153 KF ( )	.015	〃	5.0	8.2	〃	〃	〃	〃	〃
〃 6183 KF ( )	.018	〃	4.9	10.0	〃	〃	〃	〃	〃
〃 6223 KF ( )	.022	〃	5.3	10.5	〃	〃	〃	〃	〃
〃 6273 KF ( )	.027	〃	5.5	10.9	〃	〃	〃	〃	〃
〃 6333 KF ( )	.033	〃	6.0	11.9	〃	〃	〃	〃	〃
〃 6393 KF ( )	.039	〃	〃	13.4	〃	〃	〃	〃	〃
〃 6473 KF ( )	.047	〃	6.5	13.5	〃	〃	〃	〃	〃
〃 6563 KF ( )	.056	18.5	5.4	10.5	15.0	〃	〃	〃	B
〃 6683 KF ( )	.068	〃	5.8	11.0	〃	〃	〃	〃	〃
〃 6823 KF ( )	.082	〃	6.5	12.0	〃	〃	〃	〃	〃
〃 6104 KF ( )	.1	〃	6.3	14.0	〃	〃	〃	〃	〃
〃 6124 KF ( )	.12	〃	〃	14.5	〃	〃	〃	0.8	〃
〃 6154 KF ( )	.15	〃	7.5	15.4	〃	〃	〃	〃	〃
〃 6184 KF ( )	.18	〃	8.0	16.0	〃	〃	〃	〃	〃
〃 6224 KF ( )	.22	〃	9.0	16.5	〃	〃	〃	〃	〃
〃 6274 KF ( )	.27	26.0	7.0	〃	22.5	15.0	〃	〃	〃
〃 6334 KF ( )	.33	〃	7.8	17.0	〃	〃	〃	〃	〃
〃 6394 KF ( )	.39	〃	8.5	17.9	〃	〃	〃	〃	〃
〃 6474 KF ( )	.47	〃	9.3	18.5	〃	〃	〃	〃	〃
〃 6564 KF ( )	.56	〃	10.0	20.0	〃	〃	1.5	〃	〃
〃 6684 KF ( )	.68	〃	11.5	21.0	〃	〃	〃	〃	〃
〃 6824 KF ( )	.82	31.0	11.3	20.5	27.5	22.5	〃	〃	〃
〃 6105 KF ( )	1.0	〃	12.5	21.9	〃	〃	〃	〃	〃
〃 6125 KF ( )	1.5	〃	13.5	23.0	〃	〃	〃	〃	〃
〃 6155 KF ( )	1.5	〃	15.3	24.7	〃	〃	〃	〃	〃
〃 6185 KF ( )	1.8	〃	16.8	27.0	〃	〃	〃	〃	〃
〃 6225 KF ( )	2.2	〃	19.5	29.0	〃	〃	〃	〃	〃

↑ Suffix "B" for Crimped lead as Type-2. Not standard

ECQ-UH Series

- This series is especially designed as interference suppressor and recognized by UL and CSA. Due to mixed dielectric of metallized polyester and polypropylene, volumetric efficiency is improved.
- Excellent active and passive flame-retardent properties



■ Approvals

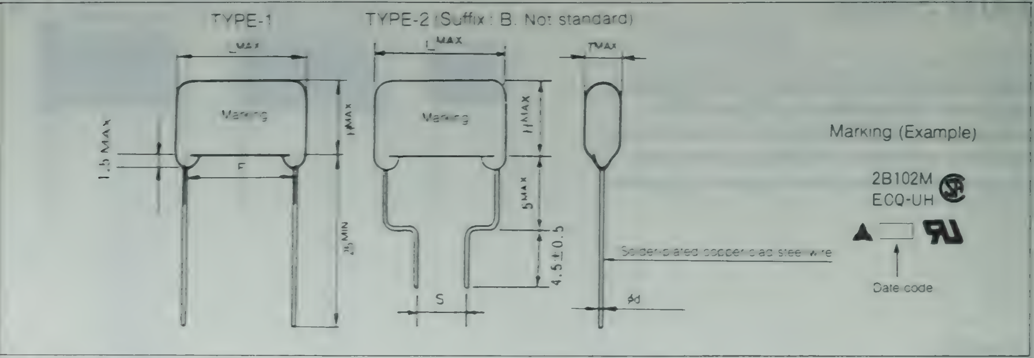
- Recognized as Type ECQ-UH, UL, File No. E62674
- Recognized as Type ECQ-UH, CSA File No. LR 35752

★ When applying to UL or CSA, designate this capacitor just as "ECQ-UH", without specifying part code.

■ Specifications

Reference standard	UL 1414, Standard for Across-the-Line Capacitors, Antenna-Coupling and Line-by-Pass Components for Radio- and Television-Type Appliances CSA C22.2 No. 0, No.1, Antenna Isolation and Line-by-Pass Capacitor. Bulletin No. 975, Across-the-Line Capacitor.
Operating temp. range	−40~+85°C
Rated voltage	AC 125 V
Capacitance range	0.001~0.47μF
Capacitance tolerance	±20% (M)
Dissipation factor	≦1.0% (20°C, 1 kHz)
Withstand voltage	Between terminals: AC 1000 V, 1 minute Between terminal and enclosure: AC 1500 V, 1 minute
Insulation resistance	≧10,000 MΩ (20°C, DC 100 V, 1 minute), ≧2,000 MΩ (20°C, DC 500 V, 1 minute)
Construction	Metallized polyester/polypropylene film, flame retardant epoxy resin coating

■ Dimensions & Marking

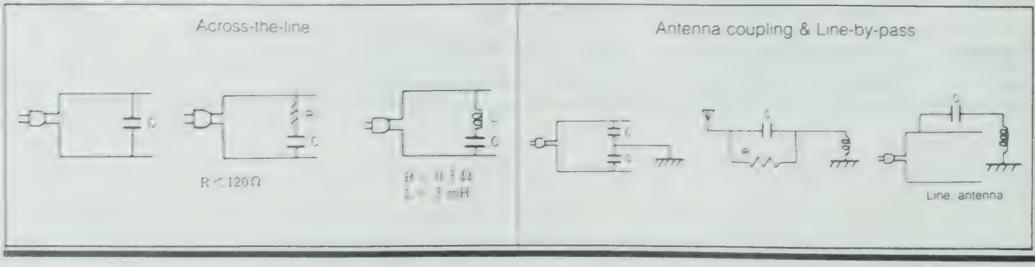


■ 125V AC

Part Code	Capacitance (μF)	Dimensions (mm)						
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.25 TYPE-1	S±0.8 TYPE-2	ϕd±0.05	G^{MAX}
ECQ U1A102MH( )	.001	17.0	6.5	13.5	13.5	10.0	0.6	1.5
〃 1A122MH( )	.0012	〃	7.0	〃	〃	〃	〃	〃
〃 1A152MH( )	.0015	〃	〃	〃	〃	〃	〃	〃
〃 1A182MH( )	.0018	〃	〃	14.0	〃	〃	〃	〃
〃 1A222MH( )	.0022	〃	6.5	13.5	〃	〃	〃	〃
〃 1A272MH( )	.0027	〃	7.0	14.0	〃	〃	〃	〃
〃 1A332MH( )	.0033	〃	6.5	13.5	〃	〃	〃	〃
〃 1A392MH( )	.0039	〃	7.0	〃	〃	〃	〃	〃
〃 1A472MH( )	.0047	〃	6.5	〃	〃	〃	〃	〃
〃 1A562MH( )	.0056	〃	〃	〃	〃	〃	〃	〃
〃 1A682MH( )	.0068	〃	7.0	〃	〃	〃	〃	〃
〃 1A822MH( )	.0082	〃	6.5	〃	〃	〃	〃	〃
〃 1A103MH( )	.01	〃	7.0	14.0	〃	〃	〃	〃
〃 1A123MH( )	.012	〃	6.5	13.5	〃	〃	〃	〃
〃 1A153MH( )	.015	〃	7.0	14.0	〃	〃	〃	〃
〃 1A183MH( )	.018	19.0	6.5	13.5	15.5	12.5	〃	〃
〃 1A223MH( )	.022	〃	7.0	14.0	〃	〃	〃	〃
〃 1A273MH( )	.027	〃	7.5	15.0	〃	〃	〃	〃
〃 1A333MH( )	.033	〃	8.0	15.5	〃	〃	〃	〃
〃 1A393MH( )	.039	25.5	6.5	13.5	21.5	17.5	〃	〃
〃 1A473MH( )	.047	〃	7.0	14.0	〃	〃	〃	〃
〃 1A563MH( )	.056	〃	7.5	15.0	〃	〃	〃	〃
〃 1A683MH( )	.068	〃	8.5	15.5	〃	〃	〃	〃
〃 1A823MH( )	.082	〃	9.0	16.5	〃	〃	0.8	〃
〃 1A104MH( )	.1	30.5	7.5	17.0	26.5	22.5	〃	〃
〃 1A124MH( )	.12	〃	9.0	17.5	〃	〃	〃	〃
〃 1A154MH( )	.15	〃	10.0	18.5	〃	〃	〃	〃
〃 1A184MH( )	.18	〃	11.0	19.0	〃	〃	〃	〃
〃 1A224MH( )	.22	〃	12.0	20.0	〃	〃	〃	〃
〃 1A274MH( )	.27	〃	13.0	22.0	〃	〃	〃	〃
〃 1A334MH( )	.33	〃	14.5	23.0	〃	〃	〃	〃
〃 1A394MH( )	.39	35.0	14.0	〃	30.5	25.0	〃	〃
〃 1A474MH( )	.47	〃	15.5	24.5	〃	〃	〃	〃

Suffix "B" for Crimped lead as Type-2. (Not standard)

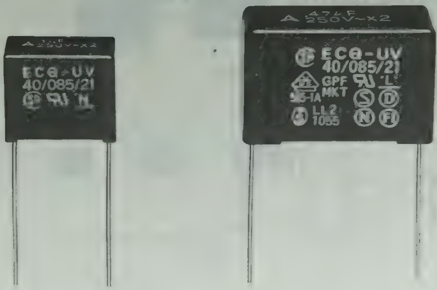
■ Example of Application


Across-the-line

Antenna coupling & Line-by-pass

ECQ-UV Series

This series is especially designed as radio interference suppressors in accordance with UL/CSA and European safety regulations class X. Using self-healing metallized polyester and flame resistant preformed case with epoxy endfill.



Features

- Excellent active and passive flame-resistant properties
- Withstand overvoltage stressing
- Wide capacitance range (0.001μF~1.0μF)

Applications

- Radio interference Suppressors

★ When applying for UL/CSA and European standard designate this capacitor just as "ECQ-UV", without specifing part code.

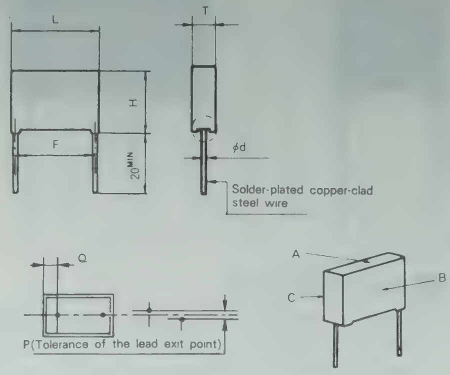
Applicable Standard & Approval Number

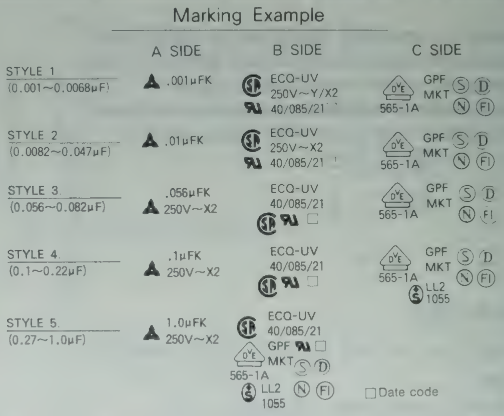
UL	: UL 1283	Electromagnetic Interference Filters	File No. E79502
CSA	: CSA C22.2	No. 0-M1982, No. 1-M1981	File No. LR35752/LR65219
		Across-the-Line, Antenna-Isolation and Line-by-Pass Capacitor.	
SEMKO	: SS 443 04 14	Class X2 (0.001-1.0μF)	Reg No. 8804123
		Class Y (0.001-0.0068μF)	
DEMKO	: Afsnit 21	Class X2 (0.001-1.0μF)	Ref No. 89275 EC
		Class Y (0.001-0.0068μF)	
NEMKO	: NEMKO 132	Class X2 (0.001-1.0μF)	(X2) Ref No. 37892
		Class Y (0.001-0.0068μF)	(Y) Ref No. 37894
EI	: IEC 384/14	Class X2 (0.001-1.0μF)	Reg No. 110918-01…02
		Class Y (0.001-0.0068μF)	
VDE	: VDE 0565-1	Class X2 (0.001-1.0μF)	File No. 4811.6-4670-1070
		Class Y (0.001-0.0068μF)	
SEV	: SEV 1055	Class X (0.1-1.0μF)	Ref No. 88,1 00318,01

Specificafions

Reference standard	UL, CSA, SEMKO, DEMKO, NEMKO, EI, VDE, SEV
Operating temp. range	−40~+85℃
Rated voltage	AC 250V
Capacitance range	0.001~1.0μF
Capacitance tolerance	±20%(M) 〔(±10% (K) upon request), Not standard
Dissipation factor	1.0% Max. (20℃ 1kHz)
Withstanding voltage	Between terminals C≦0.0068μF : AC1500V, DC 2121V 1minute C>0.0068μF : AC 1000V, DC 1414V 1minute Between terminals and enclosure : AC 2000V 1minute
Insulation resistance	C≦0.33μF : 15000MΩ Min. (20℃ DC 100V 1minute) C>0.33μF : 5000MΩ·μF Min. 2000MΩ Min. (20℃ DC 500V 1minute)
Construction	Metallized Polyester, Flame retardant Plastic case (Flame retardant resin endfill)

Dimensions & Marking


L
T
H
F
20 MIN
ϕd
Solder-plated copper-clad steel wire
Q
P(Tolerance of the lead exit point)
A
B
C



Marking Example

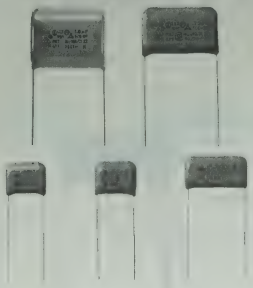
	A SIDE	B SIDE	C SIDE
STYLE 1 (0.001~0.0068µF)	.001µFK	ECQ-UV 250V~Y/X2 40/085/21	GPF MKT 565-1A
STYLE 2 (0.0082~0.047µF)	.01µFK	ECQ-UV 250V~X2 40/085/21	GPF MKT 565-1A
STYLE 3 (0.056~0.082µF)	.056µFK 250V~X2	ECQ-UV 40/085/21 □	GPF MKT 565-1A
STYLE 4 (0.1~0.22µF)	.1µFK 250V~X2	ECQ-UV 40/085/21 □	GPF MKT 565-1A LL2 1055
STYLE 5 (0.27~1.0µF)	1.0µFK 250V~X2	ECQ-UV 40/085/21 GPF □ MKT 565-1A LL2 1055	

□Date code

250 VAC

Part code	Capacitance (µF)	Dimensions(mm)						
		L±0.5	T±0.5	H±0.5	F±0.4	ϕd±0.05	P	$Q^{+1.4}_{-0.6}$
ECQ U2A102MV	.001	17.5	4.0	10.5	15.0	0.6	0±0.5	1.3
〃 2A122MV	.0012	〃	〃	〃	〃	〃	〃	〃
〃 2A152MV	.0015	〃	〃	〃	〃	〃	〃	〃
〃 2A182MV	.0018	〃	〃	〃	〃	〃	〃	〃
〃 2A222MV	.0022	〃	〃	〃	〃	〃	〃	〃
〃 2A272MV	.0027	〃	〃	〃	〃	〃	〃	〃
〃 2A332MV	.0033	〃	〃	〃	〃	〃	〃	〃
〃 2A392MV	.0039	〃	〃	〃	〃	〃	〃	〃
〃 2A472MV	.0047	〃	〃	〃	〃	〃	〃	〃
〃 2A562MV	.0056	〃	〃	〃	〃	〃	〃	〃
〃 2A682MV	.0068	〃	〃	〃	〃	〃	〃	〃
〃 2A822MV	.0082	〃	〃	〃	〃	〃	〃	〃
〃 2A103MV	.01	〃	〃	〃	〃	〃	〃	〃
〃 2A123MV	.012	〃	〃	〃	〃	〃	〃	〃
〃 2A153MV	.015	〃	〃	〃	〃	〃	〃	〃
〃 2A183MV	.018	〃	4.5	〃	〃	〃	〃	〃
〃 2A223MV	.022	〃	〃	〃	〃	〃	〃	〃
〃 2A273MV	.027	〃	〃	13.0	〃	〃	〃	〃
〃 2A333MV	.033	〃	〃	〃	〃	〃	〃	〃
〃 2A393MV	.039	〃	5.5	12.5	〃	〃	〃	〃
〃 2A473MV	.047	〃	〃	〃	〃	〃	〃	〃
〃 2A563MV	.056	〃	7.0	14.0	〃	〃	〃	〃
〃 2A683MV	.068	〃	〃	〃	〃	〃	〃	〃
〃 2A823MV	.082	〃	8.0	15.0	〃	〃	〃	〃
〃 2A104MV	.1	〃	〃	〃	〃	0.8	〃	〃
〃 2A124MV	.12	25.5	6.5	16.5	22.5	〃	〃	1.5
〃 2A154MV	.15	〃	〃	〃	〃	〃	〃	〃
〃 2A184MV	.18	〃	8.5	17.0	〃	〃	〃	〃
〃 2A224MV	.22	〃	〃	〃	〃	〃	〃	〃
〃 2A274MV	.27	30.5	10.0	18.0	27.5	〃	0±0.75	〃
〃 2A334MV	.33	〃	〃	〃	〃	〃	〃	〃
〃 2A394MV	.39	〃	12.0	20.0	〃	〃	〃	〃
〃 2A474MV	.47	〃	〃	〃	〃	〃	〃	〃
〃 2A564MV	.56	〃	13.5	23.5	〃	〃	〃	〃
〃 2A684MV	.68	〃	〃	〃	〃	〃	〃	〃
〃 2A824MV	.82	〃	16.5	26.5	〃	〃	〃	〃
〃 2A105MV	1.0	〃	〃	〃	〃	〃	〃	〃

ECQ-UN/ECQ-UP Series



- This series is especially designed as Interference Suppressors and recognized UL/CSA as well as European Standard Class X.
- The ECQ-UN/ECQ-UP capacitor, using self-healing metallized polyester and polypropylene film with epoxy resin coated.
- Excellent active and passive flame-retardant properties.

■ Applicable Standard & Approval Number

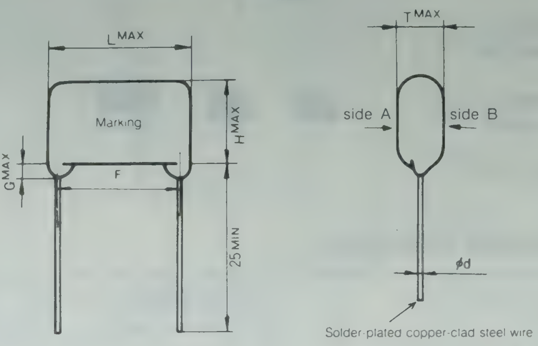
Type International Standard	ECQ-UN (0.001μF~0.22μF)	ECQ-UP (0.27μF~1.0μF)
UL	UL 1414 Across-the-Line Capacitor & Antenna-Coupling and Line-by-pass components. File No. E62674	——
CSA	CSA C22.2 No. 0-M1982, No. 1-M1981 Across-the-Line, Antenna-Isolation & Line-by-Pass Capacitor File No. LR35752	——
VDE	VDE 0565-1 class X 2, File No. 4811. 6-4670-1041	VDE 0565-1 class X 2, File No. 4811. 6-4670-1041
SEV	SEV1055 class X, Ref. No. J1. 21/455 (only for 0.047μF~0.22μF)	SEV 1055 class X, Ref. No. 875-50040. 01
DEMKO	Afsnit 21 class X 2, Ref. No. 70726EC	Afsnit 21 class X 2, Ref. No. 70726EC
SEMKO	SS4430414 class X 2, Reg. No. 8602146	SS4430414 class X 2, Reg. No. 8651180
NEMKO	NEMKO 132 class X 2, Ref. No. E25082 02.	NEMKO 132 class X 2, Ref. No. E34420
EI	E384/14 class X 2, Reg. No. 062521 01-14 (0.001μF~0.012μF) Reg. No. 062522 01-15 (0.015μF~0.22μF)	E384/14 class X 2, Reg. No. 098117-01

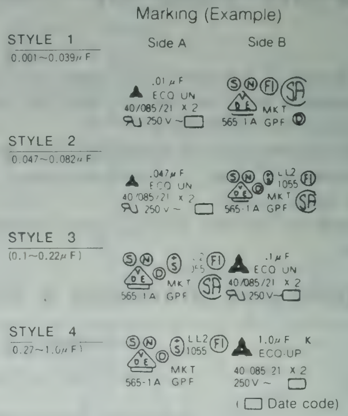
★When applying for UL/CSA and European standard designate this capacitor just as "ECQ-UN" or "ECQ-UP" without specifying part code.

■ Specifications

Rated voltage	AC 250 V
Capacitance range	0.001μF~1.0μF
Capacitance tolerance	±20% (M) 〔(±10% (K) upon request), Not standrd〕
Temperature range	−40°C~+85°C
Dissipation factor	Less than 1.0% (at 20°C and 1kHz)
Withstand voltage	Between terminals : AC 1000 V for 1 min.
	Between terminals and enclosure : AC 2000 V for 1 min.
Insulation resistance	More than 15,000 MΩ at 100 V DC, 20°C (C≦0.33μF)
	More than 5,000 MΩ at 100 V DC, 20°C (C>0.33μF)
Construction	Metallized polyester/polypropylene film, flame retardant epoxy resin coating

■ Dimensions & Marking



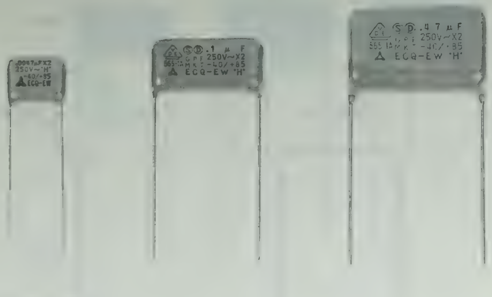


■ 250V AC

Part code	Capacitance (μF)	Dimensions(mm)					
		L^{MAX}	T^{MAX}	H^{MAX}	F±1.25	ϕd±0.05	G^{MAX}
ECQ U2A102MN	.001	17.0	6.5	13.5	13.5	0.6	1.5
〃 2A122MN	.0012	〃	7.0	〃	〃	〃	〃
〃 2A152MN	.0015	〃	〃	〃	〃	〃	〃
〃 2A182MN	.0018	〃	〃	14.0	〃	〃	〃
〃 2A222MN	.0022	〃	6.5	13.5	〃	〃	〃
〃 2A272MN	.0027	〃	7.0	14.0	〃	〃	〃
〃 2A332MN	.0033	〃	6.5	13.5	〃	〃	〃
〃 2A392MN	.0039	〃	7.0	〃	〃	〃	〃
〃 2A472MN	.0047	〃	6.5	〃	〃	〃	〃
〃 2A562MN	.0056	〃	〃	〃	〃	〃	〃
〃 2A682MN	.0068	〃	7.0	〃	〃	〃	〃
〃 2A822MN	.0082	〃	6.5	〃	〃	〃	〃
〃 2A103MN	.01	〃	7.0	14.0	〃	〃	〃
〃 2A123MN	.012	〃	6.5	13.5	〃	〃	〃
〃 2A153MN	.015	〃	7.0	14.0	〃	〃	〃
〃 2A183MN	.018	19.0	6.5	13.5	15.5	〃	〃
〃 2A223MN	.022	〃	7.0	14.0	〃	〃	〃
〃 2A273MN	.027	〃	7.5	15.0	〃	〃	〃
〃 2A333MN	.033	〃	8.0	15.5	〃	〃	〃
〃 2A393MN	.039	25.5	6.5	13.5	21.5	〃	〃
〃 2A473MN	.047	〃	7.0	14.0	〃	〃	〃
〃 2A563MN	.056	〃	7.5	15.0	〃	〃	〃
〃 2A683MN	.068	〃	8.5	15.5	〃	〃	〃
〃 2A823MN	.082	〃	9.0	16.5	〃	0.8	〃
〃 2A184MN	.1	30.5	7.5	17.0	26.5	〃	〃
〃 2A124MN	.12	〃	9.0	17.5	〃	〃	〃
〃 2A154MN	.15	〃	10.0	18.5	〃	〃	〃
〃 2A184MN	.18	〃	11.0	19.0	〃	〃	〃
〃 2A224MN	.22	〃	12.0	20.0	〃	〃	〃
ECQ U2A274MP	.27	〃	12.5	22.0	〃	〃	〃
〃 2A334MP	.33	〃	14.0	23.0	〃	〃	〃
〃 2A394MP	.39	34.5	13.5	〃	30.5	〃	〃
〃 2A474MP	.47	〃	15.0	24.0	〃	〃	〃
〃 2A564MP	.56	〃	16.5	26.0	〃	〃	〃
〃 2A684MP	.68	〃	18.0	27.5	〃	〃	〃
〃 2A824MP	.82	〃	20.5	29.0	〃	〃	〃
〃 2A105MP	1.0	〃	22.5	31.5	〃	〃	〃

ECQ-EW Series

SEMKO, DEMKO, VDE UL approved as class X. Using metallized polyester film with non-inductive wound construction with a flame-retardant epoxy resin coated.



Approvals

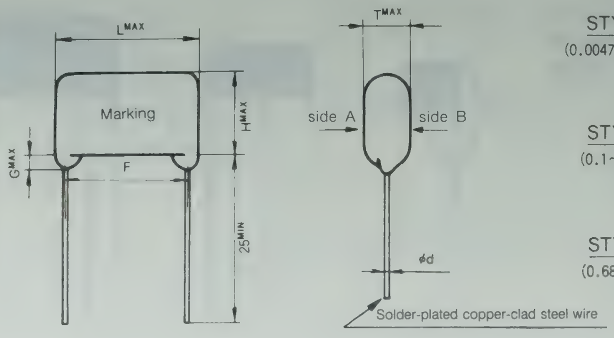
SEMKO : SS 4403414 class X2 Reg. No. 8932009
DEMKO : Afsnit 21 class X2 Ref. No. 94911EC
VDE : VDE 0565-1 class X2, File No. 4811.6-4670-1035/A2I
UL : UL-1283 class X, File No. E79502

★ When applying for the regulation, designate this capacitor just as "ECQ-EW", without specifying part code.

Specifications

Reference standard	SEMKO, DEMKO, VDE, UL
Operating temp. range	−40~+85°C
Rated voltage	AC 250 V
Capacitance range	0.0047~1.0 μF
Capacitance tolerance	±20% (M) 〔(±10% (K) upon request) Not standard〕
Dissipation factor	≦1.0% (20°C 1 kHz)
Withstand voltage	Between terminals: DC 1075 V, 1 minute Between terminal and enclosure: AC 2000 V, 1 minute
Insulation resistance	C≦0.33 μF: ≧15,000 MΩ C>0.33 μF: ≧5,000 MΩ·μF (20°C, DC 100 V, 1 minute)
Construction	Metallized polyester film, flame retardant epoxy resin coating

Dimensions & Marking



Marking (Example)

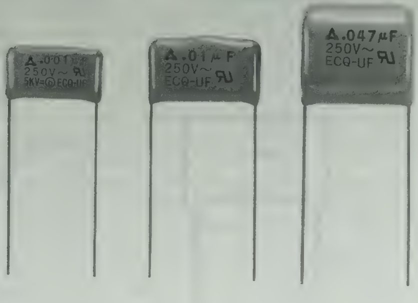
	Side A	Side B
STYLE 1 (0.0047~0.068μF)	.0047μFX2 250V~☐ -40/+85 ECQ-EW	ⓈⒹ 565-1A GPF MKT
STYLE 2 (0.1~0.47μF)	Ⓢ Ⓓ .1μF GPF250~X2 565-1A MKT-40/+85 ECQ-EW☐	
STYLE 3 (0.68~1.0μF)	.68μF GPF250V~X2 565-1A MKT-40/+85 ECQ-EW☐	※☐ Date code

250V AC

Part code	Capacitance (μF)	Dimensions(mm)					
		L^MAX	T^MAX	H^MAX	F±1.25	ϕd±0.05	G^MAX
ECQ E2A472MW	.0047	13.5	7.0	12.0	10.5	0.6	1.5
〃 2A682MW	.0068	〃	6.5	〃	〃	〃	〃
〃 2A103MW	.01	〃	〃	11.5	〃	〃	〃
〃 2A153MW	.015	〃	〃	〃	〃	〃	〃
〃 2A223MW	.022	〃	7.0	12.0	〃	〃	〃
〃 2A333MW	.033	17.0	6.5	〃	13.5	〃	〃
〃 2A473MW	.047	〃	7.5	13.0	〃	〃	〃
〃 2A683MW	.068	〃	8.5	14.5	〃	〃	〃
〃 2A104MW	.1	24.0	8.0	13.5	20.5	0.8	〃
〃 2A154MW	.15	〃	8.5	16.0	〃	〃	〃
〃 2A224MW	.22	〃	10.5	17.5	〃	〃	〃
〃 2A334MW	.33	29.0	11.0	18.0	25.5	〃	〃
〃 2A474MW	.47	〃	13.0	20.5	〃	〃	〃
※ 〃 2A684MW	.68	42.5	12.0	20.0	38.5	〃	〃
※ 〃 2A105MW	1.0	〃	14.0	23.0	〃	〃	〃

Nate: Part code with asterisk mark (※) are not approved by SEMKO, DEMKO, and UL.

ECQ-UF Series



- This series is especially designed as interference suppressor and recognized by UL/CSA as well as European Standard Class Y.
- The ECQ-UF capacitor, using Self-healing metallized polyester Film with epoxy resin coated.
- Excellent active and passive flame-relardent properties

Approvals

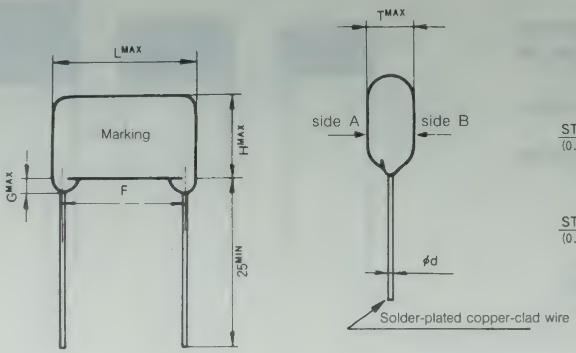
SEMKO: SEMKO 101 Reg. No. 61-88271/1-4
DEMKO: Afsnit 21 class Y/X Ref. No. 61254EC
VDE: VDE 0565-1 class Y/X2 File No. 4811-6-1-4670-1032
BSI: BS 415: . . .certified No. 6026
UL: UL 1414 Across-the-Line Capacitor & Antenna-Coupling and Line-by-pass File No. E62674
CSA: CSA C22.2 No. 0-M1982, No. 1-M1981
Across-the-Line, Antenna-Isolation & Line-by-Pass Capacitor File No. LR35752

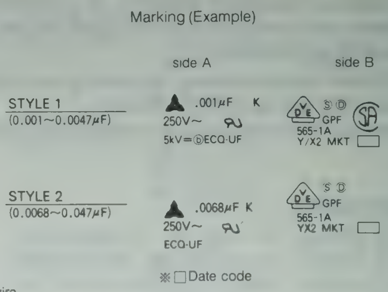
★ When applying for the regulation, designate this capacitor just as "ECQ-UF", without specifying part code.

Specifications

Reference standard	SEMKO, DEMKO, VDE, BS, UL, CSA
Operating temp range	−40~+85°C
Rated voltage	AC 250 V
Capacitance range	0.001~0.047 μF
Capacitance tolerance	±20 (M) 〔(±10% (K) upon request) Not standard〕
Dissipation factor	≦1.0% (20°C, 1 kHz)
Withstand voltage	Between terminals: AC 2000 V, 1 minute Between terminal and enclosure: AC 2000 V, 1 minute
Insulation resistance	≧15,000 MΩ (20°C, DC 100 V, 1 minute), ≧2,000 MΩ (20°C, DC 500 V, 1 minute)
Construction	Metallized polyester film, flame retardant epoxy resin coating

■ Dimensions & Marking





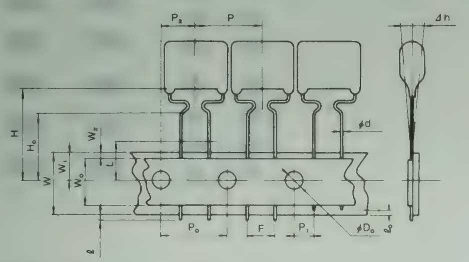
■ 250V AC

Part Code	Capacitance (μF)	Dimensions(mm)					
		L^MAX	T^MAX	H^MAX	F±1.25	φd±0.05	G^MAX
ECQ U2A102MF	.001	20.0	6.0	13.0	16.5	0.6	1.5
〃 2A152MF	.0015	〃	〃	〃	〃	〃	〃
〃 2A222MF	.0022	〃	〃	〃	〃	〃	〃
〃 2A332MF	.0033	〃	〃	13.5	〃	〃	〃
〃 2A472MF	.0047	〃	7.0	14.5	〃	〃	〃
〃 2A682MF	.0068	23.0	6.5	14.0	19.5	〃	〃
〃 2A103MF	.01	〃	7.5	15.0	〃	〃	〃
〃 2A153MF	.015	〃	9.0	16.5	〃	0.8	〃
〃 2A223MF	.022	〃	10.5	18.0	〃	〃	〃
〃 2A333MF	.033	〃	13.0	20.5	〃	〃	〃
〃 2A473MF	.047	〃	16.5	22.0	〃	〃	〃

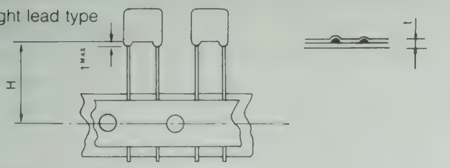
Specifications for Automatic Insertion (Not Standard/upon request only)

■ Dimensions

Lead crimped type (Not standard)



Straight lead type



Code	Dimensions
P	12.7±1.0
P_0	12.7±0.2
P_1	3.85±0.5
P_2	6.35±1.3
d	ϕ0.6±0.05 ★
F	5.0±0.8
Δh	0±2.0
W	18.0±0.5
W_0	more than 9.5
W_1	9.0±0.5
W_2	0~3.0
H	22.0±0.75 ★★
H_0	16.0±0.5
ℓ	less than 2.0
ℓ_0	less than 7.0
D_0	ϕ4.0±0.2
t	0.7±0.2
L	less than 11.0

Remarks:

★For exact lead diameter, see respective dimensions table.

★★20±0.75 for type ECQ-V,
18±0.5 for staight lead taped type

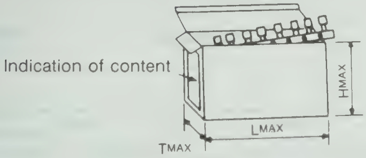
■Products for Automatic Insertion

Type	Rated voltage	Capacitance range	
		Crimped lead type	Straight lead type
ECQ-V	DC50V	0.01~1.0μF	0.01~0.12μF
	DC63V	0.01~0.68μF	0.01~0.12μF
	DC100V	0.01~0.47μ	0.01~0.1μF
ECQ-B(F)	DC50V	0.0001~0.01μF	0.0001~0.01μF
ECQ-E(F)	DC100V	0.01~1.0μF	0.01~0.1μF
	DC250V	0.01~0.33μF	——
	DC400V	0.01~0.1μF	——
	DC630V	0.01~0.033μF	——

Note: Othen C-value or Taping type available upon request.

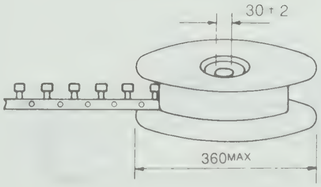
■ Packing (Not standard)

Ammo packing



Case size	Dimensions (mm)		
	LMAX	TMAX	HMAX
No.1	335	55	210
No.2	〃	〃	260
No.3	〃	〃	320

Reel packing



■ Part Number Code

E C Q | V | 1 H | 1 0 4 | J | Z | 3

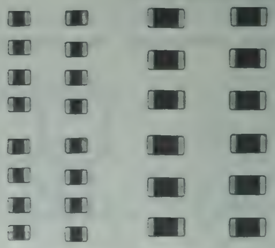
- E C Q: Type
- 1 H: Rated voltage
- 1 0 4: Cap value
- J: Tolerance
- Z: Suffix for construction, shape, etc.
- 3: Suffix for Lead shape and Packing style

Suffix for Lead shape and Packing style

Lead shape	Ammo	Reel
Crimped	3	9
Straight	※2	5

※ "4" for ECQ-B (F) series

Multilayer Ceramic Chip Capacitors



Features

- Small in size and wide capacitance range.
- Superior humidity characteristic and long life due to complete sealing of inner electrods.
- Excellent solderability and resistance to soldering heat thanks to terminals with three layers.
- Low inductance and excellent frequency characteristics.

Related Standards

- JIS C6429
- EIAJ (Electronic Industries Association of Japan) -RC3402
- EIA RS198
- IEC Pub. 384-10

Applications

- Class I (TC Type)
  - Temperature compensation
  - Tuned Circuit and Fillters
- Class II (Hi-K Type)
  - By-pass and Coupling

Part Number

1	2	3		4	5	6	7	8	9	10	11	12
E	C	U	—	V	1	H	1	0	1	J	C	M

Common Code

ECU	Multilayer Ceramic Capacitor

Packing Styles

Code	Styles
V	Paper Taping

Rated Voltage

Code	Voltage
1H	50V DC

Capacitance

Ex	Capacitance
0R5	0.5pF
010	1pF
100	10pF
101	100pF
104	100000pF (0.1μF)

Cap. Tolerance

Code	Tol	Note
C	±0.25pF	≦10 pF
D	±0.5pF	
J	±5%	>10 pF
K	±10%	
M	±20%	
Z	+80 −20%	

Temp. Char.

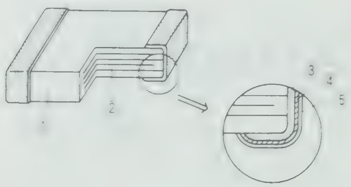
Code	Temp. Char
C	NPO
B	B X7R 2B4
F	F Y5V 2F4
E	Z5U

Suffix

Code	Size Code	
N	12 Type	0805
G	12 Type ※	
M	13 Type	1206
H	13 Type ※	

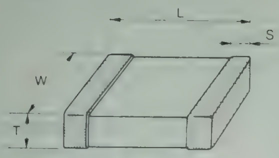
※Extended capacitance range products.

Construction



No.	Name	Material
①	Ceramic Dielectric	Ceramics
②	Inner electrode	Palladium
③	Subtrate electrode	Silver
④	Intermediate electrode	Nickel
⑤	External electrode	Solder

■Dimensions



Unit : mm

Size code (EIAJ)	Size code (EIA)	L	W	T	S
"12" Type	"0805"	2.0±0.2	1.25±0.2	1.45max.※	0.5±0.25
"13" Type	"1206"	3.2±0.2	1.6±0.2	1.25max.※	0.6±0.3

※Depending on each capacitance.

■Capacitance Range

Class	Size code	Dim. "T" (mm)	Capacitance Range (pF)					
			NPO	B/X7R		E/Z5U	F/Y5V	
			50VDC	50VDC	25VDC	50VDC	50VDC	25VDC
I (T.C Type)	"12" (0805)	$0.65^{+0}_{-0.15}$	0.5~1000	220~22000	18000~33000	10000~33000	1000~100000	100000~220000
		$1.0^{+0}_{-0.35}$	—	27000~39000	39000~56000	47000 · 68000	—	—
	"13" (1206)	$0.65^{+0}_{-0.15}$	0.5~2700	220~56000	33000~82000	10000~68000	1000~220000	100000~470000
		$1.0^{+0}_{-0.35}$	—	68000~100000	100000~150000	100000 · 150000	330000 · 470000	—

■Specifications (Multilayer Ceramic Capacitor)

Item / Temp. Char.	NPO	B/X7R	E/Z5U	F/Y5V
Operating Temperature Range	−55 to 125°C	−55 to 125°C	−25 to 85°C	−25 to 85°C
Dielectric Withstanding Voltage	3 times of Rated Voltage, for 1 to 5 seconds.	2.5 times of Rated Voltage, for 1 to 5 seconds.	2.5 times of Rated Voltage, for 1 to 5 seconds.	2.5 times of Rated Voltage. for 1 to 5 seconds.
Capacitance	Within the specified tolerance. 0.5~1000pF : at 1MHz, 20°C Over 1000pF : at 1kHz, 20°C	Within the specified tolerance. Measured at 1kHz, 1±0.2Vrms and 20°C	Within the specified tolerance. Measured at 1kHz, 1±0.2Vrms and 20°C	Within the specified tolerance. Measured at 1kHz, 1±0.2Vrms and 20°C
Q or Dissipation Factor (tan δ)	Cap. : 0.5~30pF Q : 400+20xC min. at 1MHz (C : Cap. in pF) Cap. : 33~1000pF Q : 1000 min. at 1MHz Cap. : Over 1000pF D.F.(tanδ) : 0.2% max. at 1kHz	D.F.(tanδ) : 2.5% max. at 1kHz, 1±0.2Vrms and 20°C	D.F.(tanδ) : 2.5% max. at 1kHz, 1±0.2Vrms and 20°C	D.F.(tanδ) : 5% max. at 1kHz, 1±0.2Vrms and 20°C
Insulation Resistance	10000MΩ min.	10000MΩ min. or 500MΩ-μF min. which is the smaller		
Temperature Characteristics	〔Nominal Temperature Coefficient〕 NPO : 0ppm/°C	〔Temperature Characteristics〕 (B Char) Cap. Change : ±10% max. (−25 to +85°C) (〔X7R〕 Cap. Chang : ±15% max. (−55 to 125°C))	〔Temperature Characteristics〕 (E Char) Cap. Change : $^{+20}_{-55}$% max. (−25 to +85°C) (〔Z5U〕 Cap. Change : $^{+22}_{-56}$% max. (+10 to +85°C))	〔Temperature Characteristics〕 (F Char) Cap. Change : $^{+30}_{-80}$% max. (−25 to +85°C) (〔Y5V〕 Cap. Change : $^{+22}_{-82}$% max. (−30 to +85°C))

■E-Series Numbers

E6	1				1.5				2.2				3.3				4.7				6.8			
E12	1		1.2		1.5		1.8		2.2		2.7		3.3		3.9		4.7		5.6		6.8		8.2	
E24	1	1.1	1.2	1.3	1.5	1.6	1.8	2	2.2	2.4	2.7	3	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1

■Nominal Capacitance vs. Capacitane Tolerance

Class	Temp. char	Capacitance tolerance		Tol. code	Nominal capacitance available (pF)	
I (T.C. type)	NPO	≦10pF	±0.25pF	C	0.5, 1, 1.5, 2, 3, 4, 5	
			±0.5pF	D	1, 1.5, 2, 3, 4, 5, 7, 8, 9, 10	
		>10pF	±5%	J	E−24	Within capacitance range, E-Series numbers×10^n
			±10%	K	E−12	
II (Hi-K type)	B (X7R)	±10%		K	E−12	
		±20%		M	E−6	
	E (Z5U)	±20%		M	E−6	
	F (Y5V)	+80, −20%		Z	E−6	

■Temperature Coefficient of Class I Capacitor

T.C. / Cap.	Temp. coeff (ppm/°C)		
	≦2pF	3pF	≧4pF
NPO	0±250	0±120	0±30

■Temperature Characteristics of Class II Capacitor

Temp. char※	Cap. change	Measurement Temperature range	Refference Temperature range
B	±10% max.	−25~85°C	20°C
E	+22, −55% max.	−25~85°C	20°C
F	+30, −80% max.	−25~85°C	20°C

■Markings

- Marking shall not be stamped on the standerd products
- Markings per EIAJ-RC3402 are available on special order 〔Type 12 (0805) and type 13 (1206) only.〕

Notes :

※Temperature characteristics "B" covers "X7R" (EIA)
※Temperature characteristics "E" covers "Z5U" (EIA)
※Temperature characteristics "F" covers "Y5V" (EIA)

■Standard Products for “12” Type (EIA “0805” Type)

Capacitance (pF)	NPO		
	Capacitance Tolerance (%)	50V DC	
		Part No.	Dim. T (mm)
0.5	±0.25pF (C)	ECUV1H0R5CCN	0.65
1		ECUV1H010CCN	0.65
1.5		ECUV1H1R5CCN	0.65
2		ECUV1H020CCN	0.65
3		ECUV1H030CCN	0.65
4		ECUV1H040CCN	0.65
5		ECUV1H050CCN	0.65
6	±0.5pF (D)	ECUV1H060DCN	0.65
7		ECUV1H070DCN	0.65
8		ECUV1H080DCN	0.65
9		ECUV1H090DCN	0.65
10		ECUV1H100DCN	0.65
12	±5% (J)	ECUV1H120JCN	0.65
15		ECUV1H150JCN	0.65
18		ECUV1H180JCN	0.65
22		ECUV1H220JCN	0.65
27		ECUV1H270JCG	0.65
33		ECUV1H330JCG	0.65
39		ECUV1H390JCG	0.65
47		ECUV1H470JCG	0.65
56		ECUV1H560JCG	0.65
68		ECUV1H680JCG	0.65
82		ECUV1H820JCG	0.65
100		ECUV1H101JCG	0.65
120		ECUV1H121JCG	0.65
150		ECUV1H151JCG	0.65
180		ECUV1H181JCG	0.65
220		ECUV1H221JCG	0.65
270		ECUV1H271JCG	0.65
330		ECUV1H331JCG	0.65
390		ECUV1H391JCG	0.65
470		ECUV1H471JCG	0.65
560		ECUV1H561JCG	0.65
680		ECUV1H681JCG	0.65
820		ECUV1H821JCG	0.65
1000		ECUV1H102JCG	0.65

Capacitance (pF)	B/X7R			E/Z5U			F/Y5V		
	Capacitance Tolerance (%)	50V DC		Capacitance Tolerance (%)	50V DC		Capacitance Tolerance (%)	50V DC	
		Part No.	Dim. T (mm)		Part No.	Dim. T (mm)		Part No.	Dim. T (mm)
220	±10 (K)	ECUV1H221KBN	0.65	±20 (M)			+80 −20 (Z)		
270		ECUV1H271KBN	0.65						
330		ECUV1H331KBN	0.65						
390		ECUV1H391KBN	0.65						
470		ECUV1H471KBN	0.65						
560		ECUV1H561KBN	0.65						
680		ECUV1H681KBN	0.65						
820		ECUV1H821KBN	0.65						
1000		ECUV1H102KBN	0.65					ECUV1H102ZFN	0.65
1200		ECUV1H122KBN	0.65						
1500		ECUV1H152KBN	0.65					ECUV1H152ZFN	0.65
1800		ECUV1H182KBN	0.65						
2200		ECUV1H222KBN	0.65					ECUV1H222ZFN	0.65
2700		ECUV1H272KBN	0.65						
3300		ECUV1H332KBN	0.65					ECUV1H332ZFN	0.65
3900		ECUV1H392KBN	0.65						
4700		ECUV1H472KBG	0.65					ECUV1H472ZFN	0.65
5600		ECUV1H562KBG	0.65						
6800		ECUV1H682KBG	0.65					ECUV1H682ZFN	0.65
8200		ECUV1H822KBG	0.65						
10000		ECUV1H103KBG	0.65		ECUV1H103MEN	0.65		ECUV1H103ZFG	0.65
12000		ECUV1H123KBG	0.65						
15000		ECUV1H153KBG	0.65		ECUV1H153MEN	0.65		ECUV1H153ZFG	0.65
18000		ECUV1H183KBG	0.65						
22000		ECUV1H223KBG	0.65		ECUV1H223MEN	0.65		ECUV1H223ZFG	0.65
27000		ECUV1H273KBG	1.0						
33000					ECUV1H333MEN	0.65		ECUV1H333ZFG	0.65
39000									
47000					ECUV1H473MEN	1.0		ECUV1H473ZFG	0.65
56000									
68000					ECUV1H683MEN	1.0		ECUV1H683ZFG	0.65
82000					ECUV1H823MEN	1.0		ECUV1H104ZFG	0.65

■Stand Products for “13” Type (EIA “1206” Type)

Capacitance (pF)	NPO		
	Capacitance Tolerance (%)	50V DC	
		Part No.	Dim. T (mm)
0.5	±0.25pF (C)	ECUV1H0R5CCM	0.65
1		ECUV1H010CCM	0.65
1.5		ECUV1H1R5CCM	0.65
2		ECUV1H020CCM	0.65
3		ECUV1H030CCM	0.65
4		ECUV1H040CCM	0.65
5		ECUV1H050CCM	0.65
6	±0.5pF (D)	ECUV1H060DCM	0.65
7		ECUV1H070DCM	0.65
8		ECUV1H080DCM	0.65
9		ECUV1H090DCM	0.65
10		ECUV1H100DCM	0.65
12	±5% (J)	ECUV1H120JCM	0.65
15		ECUV1H150JCM	0.65
18		ECUV1H180JCM	0.65
22		ECUV1H220JCM	0.65
27		ECUV1H270JCM	0.65
33		ECUV1H330JCM	0.65
39		ECUV1H390JCM	0.65
47		ECUV1H470JCM	0.65
56		ECUV1H560JCM	0.65
68		ECUV1H680JCM	0.65
82		ECUV1H820JCM	0.65
100		ECUV1H101JCH	0.65
120		ECUV1H121JCH	0.65
150		ECUV1H151JCH	0.65
180		ECUV1H181JCH	0.65
220		ECUV1H221JCH	0.65
270		ECUV1H271JCH	0.65
330		ECUV1H331JCH	0.65
390		ECUV1H391JCH	0.65
470		ECUV1H471JCH	0.65
560		ECUV1H561JCH	0.65
680		ECUV1H681JCH	0.65
820		ECUV1H821JCH	0.65
1000		ECUV1H102JCH	0.65
1200		ECUV1H122JCJ	0.65
1500		ECUV1H152JCJ	0.65
1800		ECUV1H182JCJ	0.65
2200		ECUV1H222JCJ	0.65

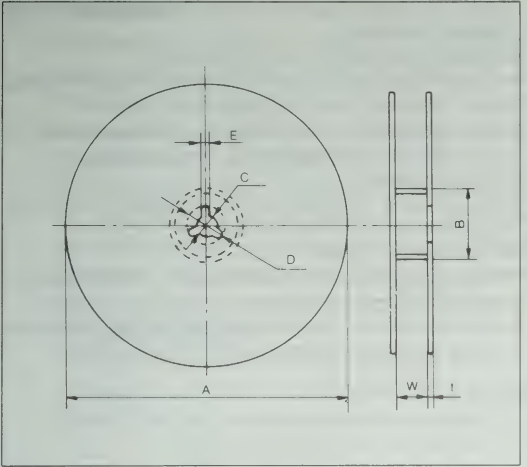
Capacitance (pF)	B/X7R			E/Z5U			F/Y5V		
	Capacitance Tolerance (%)	50V DC		Capacitance Tolerance (%)	50V DC		Capacitance Tolerance (%)	50V DC	
		Part No.	Dim. T (mm)		Part No.	Dim. T (mm)		Part No.	Dim. T (mm)
220	±10 (K)	ECUV1H221KBM	0.65	±20 (M)			+80 20 (Z)		
270		ECUV1H271KBM	0.65						
330		ECUV1H331KBM	0.65						
390		ECUV1H391KBM	0.65						
470		ECUV1H471KBM	0.65						
560		ECUV1H561KBM	0.65						
680		ECUV1H681KBM	0.65						
820		ECUV1H821KBM	0.65						
1000		ECUV1H102KBM	0.65					ECUV1H102ZFM	0.65
1200		ECUV1H122KBM	0.65						
1500		ECUV1H152KBM	0.65					ECUV1H152ZFM	0.65
1800		ECUV1H182KBM	0.65						
2200		ECUV1H222KBM	0.65					ECUV1H222ZFM	0.65
2700		ECUV1H272KBM	0.65						
3300		ECUV1H332KBM	0.65					ECUV1H332ZFM	0.65
3900		ECUV1H392KBM	0.65						
4700		ECUV1H472KBM	0.65					ECUV1H472ZFM	0.65
5600		ECUV1H562KBM	0.65						
6800		ECUV1H682KBM	0.65					ECUV1H682ZFM	0.65
8200		ECUV1H822KBM	0.65						
10000		ECUV1H103KBM	0.65		ECUV1H103MEM	0.65		ECUV1H103ZFM	0.65
12000		ECUV1H123KBM	0.65						
15000		ECUV1H153KBM	0.65		ECUV1H153MEM	0.65		ECUV1H153ZFM	0.65
18000		ECUV1H183KBM	0.65						
22000		ECUV1H223KBH	0.65		ECUV1H223MEM	0.65		ECUV1H223ZFM	0.65
27000		ECUV1H273KBH	0.65						
33000		ECUV1H333KBH	0.65		ECUV1H333MEM	0.65		ECUV1H333ZFM	0.65
39000		ECUV1H393KBH	0.65						
47000		ECUV1H473KBH	0.65		ECUV1H473MEM	0.65		ECUV1H473ZFM	0.65
56000		ECUV1H563KBH	0.65						
68000		ECUV1H683KBH	1.05		ECUV1H683MEM	0.65		ECUV1H683ZFM	0.65
82000									
100000					ECUV1H104MEM	1.0		ECUV1H104ZFM	0.65
120000									
150000					ECUV1H154MEM	1.0			

■Packaging

●Standard Packing Quantity

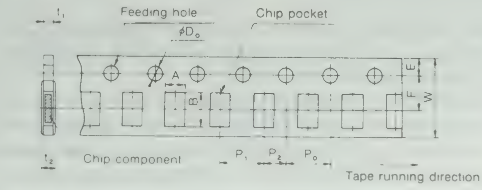
Size code	Style Thickness (mm)	Paper taping
12 (0805)	0.65	4000 or 5000pcs/reel
	1.0	4000pcs/reel
13 (1206)	0.65	4000 or 5000pcs/reel
	1.0	4000pcs/reel

●Reel for Taping



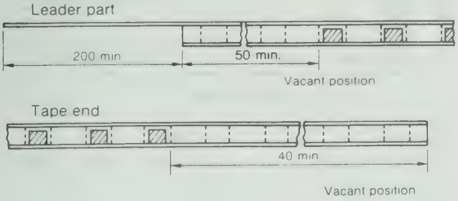
Symbol	A	B	C	D	E	W	t
Dim.(mm)	178±2.0	50min.	130±0.5	20min.	1.5min.	10.0±1.5	1.0±0.5

●Paper Taping



	Symbol / Size code	A	B	W	F	E	P₁	P₂	P₀	ϕD₀	t₁	t₂
Dim. (mm)	11 (0603)	1.10 ±0.1	1.90 ±0.1	8.0 ±0.2	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	1.5 +0.1 −0	1.1 max.	1.4 max
	12 (0805)	1.65 ±0.2	2.4 ±0.2									
	13 (1206)	2.0 ±0.2	3.6 ±0.2									

●Leader Part and Tape End



Unit mm

Precautions for Handling

1. Precautions for Soldering

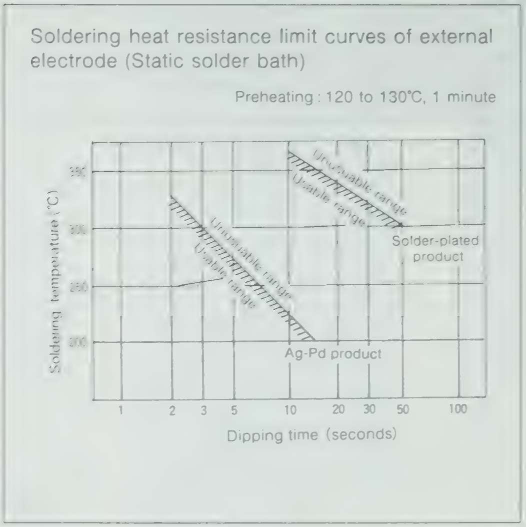
1) Note that ceramic chip capacitors will be easily damaged by rapid heating or cooling or local heating.
2) Use rosin-based flux ; do not use activated flux.
3) Before soldering, preheat to the temperature range shown in table 1. Insufficient preheating causes the ceramic element to crack, resulting in problems in the characteristics or service life reduction. Local rapid cooling such as wind suction also causes the ceramic element to crack.

Table. 1

Soldeing method	Soldering iron	flow
Temperature difference	140°C max.	120°C max.

4) It is desirable to set the soldering temperature to 240 to 250°C. Also, set the solder melting time to less than 4 seconds.
5) Fig. 1 shows the soldering heat resistance limit curves of solder-plated and Ag-Pd products. Preheat to the temperature shown in table 1 and solder within the usable range shown in Fig. 1. If soldering is repeated, an accumulation of soldering time under each condition shall be within the permissible time (Solder-plated product is our standard.)

Fig. 1



Soldering heat resistance limit curves of external electrode (Static solder bath)

2. Soldering mothod

1) Soldering iron procedure

- Preheating : Fully preheat on a heating plate whose surface temperature is 100 to 150°C
- Soldering iron used
  Soldering iron power : 20W max.
  Soldering iron tip diameter : 3mm max.
  Soldering iron tip temperature : 210 to 240°C
- Soldering : Solder on a preheating plate within 4 secconds using an soldeing iron whose tip temperature is adjusted to 210 to 240°C. The soldering iron tip shall not touch the ceramic element directly.
- Gradual cooling : After soldering, let the product to stand at room temperature to cool gradually.

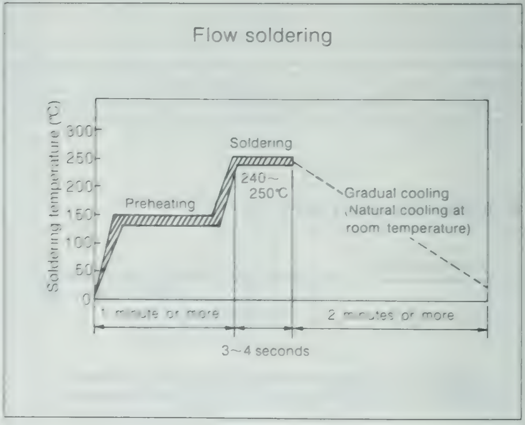
2) Reflow Soldering

- Solder used : Solder cream available.
- Temperature distribution in furnace : Soleder melting zone. 230±5°C, 5 to 10 seconds.
- Gradual heating : After soldering, let the product to stand at room temperature to cool gradully.

3) Flow soldering

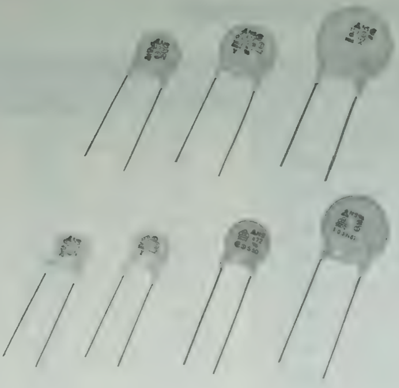
- Flux dipping : Dip the entire chip capacitors in flux solution for 5 to 10 seconds.
- Preheating : 130 to 150°C.
- Solder dipping: Dip in melted solder solution at 240 to 250°C for 3 to 4 seconds.
- Gradual cooling : After soldering, let the chip capacitors to stand at room temperature to cool gradully.

Fig. 2



Flow soldering

Ceramic Disc Capacitors Type NS



Features

Type NS is recognized by UL, CSA, BSI, SEMKO, SEV and VDE. These capacitors are used to antennacoupling, line-by-pass and across-the-line, for industrial power supply, radio and TV appliance and similar equipment.

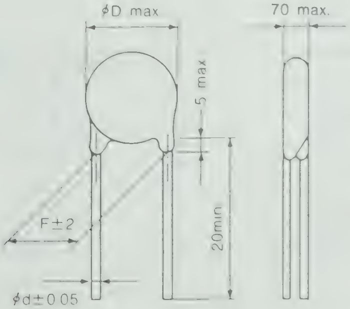
Specifications

- **Operating temperature range**: −25℃〜+85℃
- **Rated working voltage**: 125 V AC. 250 V. AC. 400 V. AC
- **Capacitance**: Within the tolerance, when measured at 1 kNz and 20℃
- **Dissipation factor**: 25% max, when measured at 1 kHz and 20℃
- **Temperature characteristics**:
  B: Max. capacitance change is ± 10% over the temperature range of −25℃ to +85℃
  E: Max. capacitance change is +20〜−55% over the temperature range of −25℃ to +85℃
  V: Max. capacitance change is +30〜−80% over the temperature range of 0℃ to +70℃
- **Dielectric strength**: Refer to specifications of each class.
- **Body insulation strength**: Reter to specifications of each class.
- **Insulation resistance**:
  10,000 megohms min, when measured after 1 minute application of the 500 V DC.
- **Dielectric and body insulation strength (For Class Ⅰ Equipment)**
  2600 V AC (50 Hz or 60 Hz) for 1 minute
  Notes, *2000 V AC for 1 minute; **2500 V. AC for 1 minute
  (Same asterisks as in Standard Products Table)
- **Dieletric strength (For Class Ⅱ Equipment)**: 4000V. AC (50 Hz or 60 Hz) for 1 minute.
- **Body insulation strength (For Class Ⅱ Equipment)**: 2000V. AC (50 Hz or 60 Hz) for 1 minute.

Type NS For Class Ⅰ Equipment

Dimensions

mm



Standard produts table

Part Number	Capacitance		T.C.	Dimensions			Note
	Rated(pF)	Tol.(%)		D	F	d	
ECK-DNS101MB	100	±20	B	11.0	7.5	0.65	
ECK-DNS151MB	150	±20	B	11.0	7.5	0.65	
ECK-DNS221MB	220	±20	B	11.0	7.5	0.65	
ECK-DNS471MB	470	±20	B	11.0	7.5	0.65	
ECK-DNS102MB	1000	±20	B	11.0	7.5	0.65	
ECK-DNS152ME	1500	±20	E	11.0	7.5	0.65	
ECK-DNS222ME	2200	±20	E	11.0	7.5	0.65	
ECK-DNS332ME	3300	±20	E	13.0	10.0	0.65	
ECK-DNS472ME	4700	±20	E	16.0	10.0	0.65	
ECK-DNS103ME	10000	±20	E	17.5	10.0	0.80	*
ECK-DNS472ZV	4700	+80, −20	V	12.0	10.0	0.65	**
ECK-DNS103ZV	10000	+80, −20	V	14.5	10.0	0.65	**
ECK-DNS223ZV	22000	+80, −20	V	24.0	10.0	0.80	**

Notes : * Approved only by UL, CSA, BS, SEMKO and SEV1055
** Approved only by UL, CSA, BS, SEMKO and VDE560-2
□ : Cap. tol. K (±10%) or M (±20%)
T.C.=Temperature characteristics

Rated working voltage

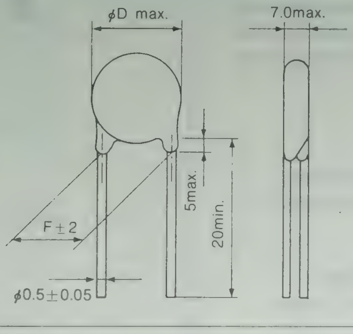
Rated voltage	Applicable standards
125V AC	UL, CSA
250V AC	VDE565-1
400V AC	VDE560-2, BS, SEMKO, SEV.

Ralated standard	Cartificate number	Note
UL 1414	E 62674	
CSA C22.2	LR 31605	
BS 415	226319	
SEMKO 101	8372418	
SEV1016	J1.31/48	T.C. B and E (1500 to 4700PF)
SEV1055	J1.21/453	T.C. E 10000PF only (X Capacitor)
VDE560-2	32543	T.C. B
	35912	T.C. E (1500 to 4700 PF)
	32542	T.C. V
VDE565-1	32544	T.C. B
	35912	T.C. E (1500 to 4700 PF)

Type NS For Class Ⅱ Equipment

Dimensions

mm



2 Standard products table

Part Number	Capacitance		T.C.	Dimensions (mm)			Note
	Rated (pF)	Tol. (%)		D	F	d	
ECK-DNS101MBX	100	± 20	B	11.0	10.0	0.65	
ECK-DNS151MBX	150	± 20	B	11.0	10.0	0.65	
ECK-DNS221MBX	220	± 20	B	11.0	10.0	0.65	
ECK-DNS471MBX	470	± 20	B	11.0	10.0	0.65	
ECK-DNS102MBX	1000	± 20	B	11.0	10.0	0.65	
ECK-DNS152MEX	1500	± 20	E	11.0	10.0	0.65	
ECK-DNS222MEX	2200	± 20	E	11.0	10.0	0.65	
ECK-DNS332MEX	3300	± 20	E	13.0	10.0	0.65	
ECK-DNS472MEX	4700	± 20	E	16.0	10.0	0.65	

T.C.=Temperature characteristics

Rated working voltage

Rated voltage	Applicable standards
125V.AC	UL, CSA
250V.AC	VDE565-1
400V.AC	VDE560-2, BS, SEMKO, SEV.

Related standard	Certificate number	Note
UL 1414	E 62674	
CSA C22.2	LR 31605	
BS415	226319	
SEMKO 101	8372418	
SEV 1016	J1.31/48	
VDE560-2	32543	T.C. B
	35912	T.C. E
VDE565-1	32544	T.C. B
	35912	T.C. E

"ZNR®" Type D

The ZNR type D which is designed to protect various kinds of electronic devices and semiconductor elements from switching and induced lightning surges provides widely varying voltage and withstanding surge current ratings.

Features

- Fast response to the rapidly rising surge voltage.
- High performance clamping voltage characteristics.
- Broad products range
  Varistor voltage: 18v to 1.8 kv
  Withstanding surge current: 50A to 6,500A
  (8 x 20μsec., 1 time)

Applications

- Transistor, diode, IC, thyristor and triac semiconductor protection.
- Surge protection in consumer electronics.
- Surge protection in industrial electronics.
- Surge protection in communication, measuring and controller electronics.
- Surge protection in electronic home appliances and gas and petroleum appliances.
- Electrostatic discharge and noise spike suppression.
- Relay and electromagnetic valve surge absorption.

Reference Guide to Standard Products

Part No.	Maximum Allowable Voltage		Varistor* Voltage	Max. Clamping Voltage @ Test Current (8 x 20μsec.)		Energy (2ms.)	Withstanding Surge Current (8 x 20μsec. 1 time)	Typical Capacitance
	ACrms(V)	DC(V)	(V)	Vc(V)	Ip(A)	(J)	(A)	@ 1kHz(pF)
ERZ-C05DK180	11	14	18 (16 ~ 20)	40	1	0.3	100	1600
ERZ-C07DK180				36	2.5	0.8	250	3500
ERZ-C10DK180				36	5	1.5	500	7500
ERZ-C14DK180				36	10	3.5	1000	18000
ERZ-C20DK180				36	20	10	2000	37000
ERZ-C03DK220	14	18	22 (20 ~ 24)	48	0.5	0.16	50	550
ERZ-C05DK220				48	1	0.4	100	1300
ERZ-C07DK220				43	2.5	0.9	250	2800
ERZ-C10DK220				43	5	2.0	500	6000
ERZ-C14DK220				43	10	4.0	1000	15000
ERZ-C20DK220				43	20	13	2000	30000
ERZ-C03DK270	17	22	27 (24 ~ 30)	60	0.5	0.2	50	450
ERZ-C05DK270				60	1	0.5	100	1050
ERZ-C07DK270				53	2.5	1.0	250	2000
ERZ-C10DK270				53	5	2.5	500	4000
ERZ-C14DK270				53	10	5.0	1000	10000
ERZ-C20DK270				53	20	15	2000	22000
ERZ-C05DK330	20	26	33 (30 ~ 36)	73	1	0.6	100	900
ERZ-C07DK330				65	2.5	1.2	250	1500
ERZ-C10DK330				65	5	3.0	500	3000
ERZ-C14DK330				65	10	6.0	1000	7500
ERZ-C20DK330				65	20	20	2000	17000
ERZ-C03DK390	25	31	39 (35 ~ 43)	86	0.5	0.32	50	230
ERZ-C05DK390				86	1	0.8	100	500
ERZ-C07DK390				77	2.5	1.5	250	1350
ERZ-C10DK390				77	5	3.5	500	2600
ERZ-C14DK390				77	10	7.0	1000	6500
ERZ-C20DK390				77	20	24	2000	15000
ERZ-C05DK470	30	38	47 (42 ~ 52)	104	1	1.0	100	450
ERZ-C07DK470				93	2.5	1.8	250	1150
ERZ-C10DK470				93	5	4.5	500	2200
ERZ-C14DK470				93	10	8.5	1000	5500
ERZ-C20DK470				93	20	30	2000	13000

Part No.	Maximum Allowable Voltage		Varistor* Voltage	Max. Clamping Voltage @ Test Current (8 x 20μsec.)		Energy (2ms.)	Withstanding Surge Current (8 x 20μsec. 1 time)	Typical Capacitance
	ACrms(V)	DC(V)	(V)	Vc(V)	Ip(A)	(J)	(A)	@ 1kHz(pF)
ERZ-C05DK560	35	45	56 (50 ~ 62)	123	1	1.0	100	400
ERZ-C07DK560				110	2.5	2.2	250	950
ERZ-C10DK560				110	5	5.5	500	1800
ERZ-C14DK560				110	10	10.0	1000	4500
ERZ-C20DK560				110	20	35	2000	11000
ERZ-C05DK680	40	56	68 (61 ~ 75)	150	1	1.2	100	350
ERZ-C07DK680				135	2.5	2.5	250	700
ERZ-C10DK680				135	5	6.5	500	1300
ERZ-C14DK680				135	10	12.0	1000	3300
ERZ-C20DK680				135	20	40	2000	7000
ERZ-C03DK820	50	65	82 (74 ~ 90)	145	2.5	0.68	200	220
ERZ-C05DK820				145	5	1.7	400	250
ERZ-C07DK820				135	10	3.5	1200	550
ERZ-C10DK820				135	25	8	2500	1800
ERZ-C14DK820				135	50	14	4500	2900
ERZ-C20DK820				135	100	27	6500	5500
ERZ-C05DK101	60	85	100 (90 ~ 110)	175	5	2.0	400	200
ERZ-C07DK101				165	10	4	1200	500
ERZ-C10DK101				165	25	10	2500	1400
ERZ-C14DK101				165	50	18	4500	2400
ERZ-C20DK101				165	100	30	6500	4800
ERZ-C03DK121	75	100	120 (108 ~ 132)	210	2.5	1.0	200	150
ERZ-C05DK121				210	5	2.5	400	170
ERZ-C07DK121				200	10	5	1200	450
ERZ-C10DK121				200	25	12	2500	1100
ERZ-C14DK121				200	50	20	4500	1900
ERZ-C20DK121				200	100	40	6500	3800
ERZ-C05DK151	95	125	150 (135 ~ 165)	260	5	3.0	400	140
ERZ-C07DK151				250	10	6	1200	350
ERZ-C10DK151				250	25	16	2500	900
ERZ-C14DK151				250	50	25	4500	1500
ERZ-C20DK151				250	100	50	6500	3000
★ERZ-C05DK201U	130	170	200 (185 ~ 225)	355	5	4.0	400	80
★ERZ-C07DK201U				340	10	10	1200	250
★ERZ-C10DK201U				340	25	20	2500	500
★ERZ-C14DK201U				340	50	35	4500	1000
★ERZ-C20DK201U				340	100	70	6500	2000
★ERZ-C05DK221U	140	180	220 (198 ~ 242)	380	5	4.5	400	70
★ERZ-C07DK221U				360	10	10	1200	250
★ERZ-C10DK221U				360	25	23	2500	450
★ERZ-C14DK221U				360	50	40	4500	1000
★ERZ-C20DK221U				360	100	75	6500	2000
ERZ-C03DK241	150	200	240 (216 ~ 264)	415	2.5	2.0	200	40
★ERZ-C05DK241U				415	5	5.0	400	70
★ERZ-C07DK241U				395	10	10	1200	200
★ERZ-C10DK241U				395	25	25	2500	400
★ERZ-C14DK241U				395	50	40	4500	900
★ERZ-C20DK241U				395	100	80	6500	1800
★ERZ-C05DK271U	175	225	270 (247 ~ 303)	475	5	6.0	400	65
★ERZ-C07DK271U				455	10	12	1200	170
★ERZ-C10DK271U				455	25	30	2500	350
★ERZ-C14DK271U				455	50	50	4500	750
★ERZ-C20DK271U				455	100	90	6500	1600
★ERZ-C05DK361U	230	300	360 (324 ~ 396)	620	5	7.5	400	50
★ERZ-C07DK361U				595	10	15	1200	130
★ERZ-C10DK361U				595	25	35	2500	300
★ERZ-C14DK361U				595	50	65	4500	550
★ERZ-C20DK361U				595	100	120	6500	1200
★ERZ-C05DK391U	250	320	390 (351 ~ 429)	675	5	8.0	400	50
★ERZ-C07DK391U				650	10	17	1200	130
★ERZ-C10DK391U				650	25	40	2500	270
★ERZ-C14DK391U				650	50	70	4500	500
★ERZ-C20DK391U				650	100	130	6500	1000
★ERZ-C05DK431U	275	350	430 (387 ~ 473)	745	5	9.0	400	45
★ERZ-C07DK431U				710	10	20	1200	110
★ERZ-C10DK431U				710	25	45	2500	250
★ERZ-C14DK431U				710	50	75	4500	450
★ERZ-C20DK431U				710	100	140	6500	900
★ERZ-C05DK471U	300	385	470 (423 ~ 517)	810	5	10.0	400	40
★ERZ-C07DK471U				775	10	20	1200	100
★ERZ-C10DK471U				775	25	45	2500	230
★ERZ-C14DK471U				775	50	80	4500	400
★ERZ-C20DK471U				775	100	150	6500	900

Part No.	Maximum Allowable Voltage		Varistor* Voltage	Max. Clamping Voltage @ Test Current (8 x 20μsec.)		Energy (2ms.)	Withstanding Surge Current (8 x 20μsec. 1 time)	Typical Capacitance
	ACrms(V)	DC(V)	(V)	Vc(V)	Ip(A)	(J)	(A)	@ 1kHz(pF)
★ERZ-C10DK621U	385	505	620 (558 ~ 682)	1025	25	45	2500	130
★ERZ-C14DK621U				1025	50	85	4500	250
★ERZ-C20DK621U				1025	100	150	6500	500
★ERZ-C10DK681U	420	560	680 (612 ~ 748)	1120	25	45	2500	130
★ERZ-C14DK681U				1120	50	90	4500	250
★ERZ-C20DK681U				1120	100	160	6500	460
★ERZ-C10DK751U	460	615	750 (675 ~ 825)	1240	25	50	2500	120
★ERZ-C14DK751U				1240	50	100	4500	230
★ERZ-C20DK751U				1240	100	175	6500	420
★ERZ-C10DK781U	485	640	780 (702 ~ 858)	1290	25	50	2500	120
★ERZ-C14DK781U				1290	50	105	4500	230
★ERZ-C20DK781U				1290	100	180	6500	420
★ERZ-C10DK821U	510	670	820 (738 ~ 902)	1355	25	55	2500	110
★ERZ-C14DK821U				1355	50	110	4500	200
★ERZ-C20DK821U				1355	100	190	6500	400
★ERZ-C10DK911U	550	745	910 (819 ~ 1001)	1500	25	60	2500	100
★ERZ-C14DK911U				1500	50	120	4500	180
★ERZ-C20DK911U				1500	100	215	6500	350
★ERZ-C10DK102U	625	825	1000 (900 ~ 1100)	1650	25	65	2500	90
★ERZ-C14DK102U				1650	50	130	4500	150
★ERZ-C20DK102U				1650	100	230	6500	320
★ERZ-C10DK112U	680	895	1100 (990 ~ 1210)	1815	25	70	2500	80
★ERZ-C14DK112U				1815	50	140	4500	150
★ERZ-C20DK112U				1815	100	250	6500	300
★ERZ-C14DK182U	1000	1465	1800 (1620~1980)	2970	50	240	4500	100
★ERZ-C20DK182U				2970	100	400	6500	200

Notes: 1. *Varistor Voltage: 3 and 5 Series — V0.1mA
7, 10, 14, 20 Series — V1mA

2. Rated Wattage:

Part No.	Rated Wattage (W)	Part No.	Rated Wattage (W)
ERZ-C03DK220 ~ 390	0.004	ERZ-C03DK820 ~ 241	0.04
ERZ-C05DK180 ~ 680	0.01	ERZ-C05DK820 ~ 471	0.1
ERZ-C07DK180 ~ 680	0.02	ERZ-C07DK820 ~ 471	0.25
ERZ-C10DK180 ~ 680	0.05	ERZ-C10DK820 ~ 112	0.4
ERZ-C14DK180 ~ 680	0.1	ERZ-C14DK820 ~ 182	0.6
ERZ-C20DK180 ~ 680	0.2	ERZ-C20DK820 ~ 182	1.0

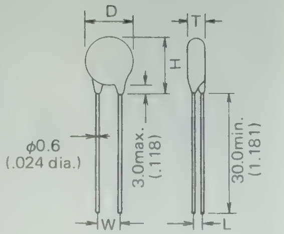
3. Operating temperature range: –40 to 85°C (–40 to 185°F)
4. Storage temperature range: –40 to 125°C (–40 to 257°F)
5. Maximum clamping voltage as a function of surge current is obtainable from the respective V-I characteristic curves.
6. Maximum leakage current: refer to the V-I curves.
7. ★: UL approved model

File No. E62674 Across the line varistor.

File No. E86821 Transient Voltage surge suppressor.

5 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 05DK180	7.5 (.295)	3.5(.138)	5.0 (.197)	10.0 (.394)	1.5(.059)	
ERZ-C 05DK220						
ERZ-C 05DK270						
ERZ-C 05DK330						
ERZ-C 05DK390						
ERZ-C 05DK470						
ERZ-C 05DK560						
ERZ-C 05DK680						
ERZ-C 05DK820						
ERZ-C 05DK101	7.0 (.276)	3.7(.146)	5.0 (.197)	10.0 (.394)	1.6(.063)	
ERZ-C 05DK121		3.8(.150)			1.8(.071)	
ERZ-C 05DK151		4.0(.157)			2.0(.079)	
★ERZ-C 05DK201U		4.2(.165)			2.0(.079)	
★ERZ-C 05DK221U		4.3(.169)			2.1(.083)	
★ERZ-C 05DK241U		4.4(.173)			2.2(.087)	
★ERZ-C 05DK271U		4.6(.181)			2.4(.094)	
★ERZ-C 05DK361U		5.2(.205)			3.0(.118)	
★ERZ-C 05DK391U		5.4(.215)			3.2(.126)	
★ERZ-C 05DK431U		5.7(.224)			3.5(.138)	
★ERZ-C 05DK471U		6.0(.236)			3.8(.150)	

Note: ★-UL approved model

Standard Products Table

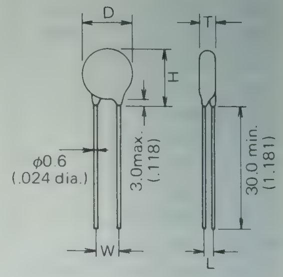
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	$V_{0.1mA}$ (V)	ACrms(V)	DC(V)	V_{1A} (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 05DK180	18 (16 – 20)	11	14	40	0.01	0.3	100	1600
ERZ-C 05DK220	22 (20 – 24)	14	18	48	0.01	0.4	100	1300
ERZ-C 05DK270	27 (24 – 30)	17	22	60	0.01	0.5	100	1050
ERZ-C 05DK330	33 (30 – 36)	20	26	73	0.01	0.6	100	900
ERZ-C 05DK390	39 (35 – 43)	25	31	86	0.01	0.8	100	500
ERZ-C 05DK470	47 (42 – 52)	30	38	104	0.01	1.0	100	450
ERZ-C 05DK560	56 (50 – 62)	35	45	123	0.01	1.0	100	400
ERZ-C 05DK680	68 (61 – 75)	40	56	150	0.01	1.2	100	350

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	$V_{0.1mA}$ (V)	ACrms(V)	DC(V)	V_{5A} (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 05DK820	82 (74 – 90)	50	65	145	0.1	1.7	400	250
ERZ-C 05DK101	100 (90 – 110)	60	85	175	0.1	2.0	400	200
ERZ-C 05DK121	120 (108 – 132)	75	100	210	0.1	2.5	400	170
ERZ-C 05DK151	150 (135 – 165)	95	125	260	0.1	3.0	400	140
★ERZ-C 05DK201U	200 (185 – 225)	130	170	355	0.1	4.0	400	80
★ERZ-C 05DK221U	220 (198 – 242)	140	180	380	0.1	4.5	400	70
★ERZ-C 05DK241U	240 (216 – 264)	150	200	415	0.1	5.0	400	70
★ERZ-C 05DK271U	270 (247 – 303)	175	225	475	0.1	6.0	400	65
★ERZ-C 05DK361U	360 (324 – 396)	230	300	620	0.1	7.5	400	50
★ERZ-C 05DK391U	390 (351 – 429)	250	320	675	0.1	8.0	400	50
★ERZ-C 05DK431U	430 (387 – 473)	275	350	745	0.1	9.0	400	45
★ERZ-C 05DK471U	470 (423 – 517)	300	385	810	0.1	10.0	400	40

Note: ★-UL approved model

7 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 07DK180	9.0 (.354)	3.5(.138)	5.0 (.197)	12.0 (.472)	1.3(.051)	
ERZ-C 07DK220		3.6(.142)			1.4(.055)	
ERZ-C 07DK270		3.7(.146)			1.5(.059)	
ERZ-C 07DK330		3.9(.154)			1.7(.067)	
ERZ-C 07DK390		3.8(.150)			1.7(.067)	
ERZ-C 07DK470		3.9(.154)			1.8(.071)	
ERZ-C 07DK560		4.0(.157)			1.9(.075)	
ERZ-C 07DK680		4.2(.165)			2.1(.083)	
ERZ-C 07DK820		3.6(.142)			1.6(.063)	
ERZ-C 07DK101		3.7(.146)			1.6(.063)	
ERZ-C 07DK121		3.8(.150)			1.8(.071)	
ERZ-C 07DK151		4.0(.157)			2.0(.079)	
⋆ERZ-C 07DK201U		4.2(.165)			2.0(.079)	
⋆ERZ-C 07DK221U		4.3(.169)			2.1(.083)	
⋆ERZ-C 07DK241U		4.4(.173)			2.2(.087)	
⋆ERZ-C 07DK271U		4.6(.181)			2.4(.094)	
⋆ERZ-C 07DK361U		5.2(.205)			3.0(.118)	
⋆ERZ-C 07DK391U		5.4(.213)			3.2(.126)	
⋆ERZ-C 07DK431U		5.7(.224)			3.5(.138)	
⋆ERZ-C 07DK471U		6.0(.236)			3.8(.150)	

Note: ⋆-UL approved model

Standard Products Table

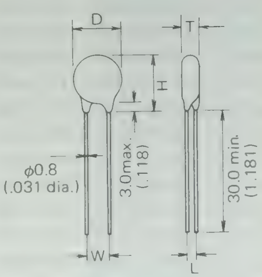
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V_{1mA}(V)	ACrms(V)	DC(V)	$V_{2.5A}$(V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 07DK180	18 (16 – 20)	11	14	36	0.02	0.8	250	3500
ERZ-C 07DK220	22 (20 – 24)	14	18	43	0.02	0.9	250	2800
ERZ-C 07DK270	27 (24 – 30)	17	22	53	0.02	1.0	250	2000
ERZ-C 07DK330	33 (30 – 36)	20	26	65	0.02	1.2	250	1500
ERZ-C 07DK390	39 (35 – 43)	25	31	77	0.02	1.5	250	1350
ERZ-C 07DK470	47 (42 – 52)	30	38	93	0.02	1.8	250	1150
ERZ-C 07DK560	56 (50 – 62)	35	45	110	0.02	2.2	250	950
ERZ-C 07DK680	68 (61 – 75)	40	56	135	0.02	2.5	250	700

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V_{1mA}(V)	ACrms(V)	DC(V)	V_{10A}(V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 07DK820	82 (74 – 90)	50	65	135	0.25	3.5	1200	550
ERZ-C 07DK101	100 (90 – 110)	60	85	165	0.25	4	1200	500
ERZ-C 07DK121	120 (108 – 132)	75	100	200	0.25	5	1200	450
ERZ-C 07DK151	150 (135 – 165)	95	125	250	0.25	6	1200	350
⋆ERZ-C 07DK201U	200 (185 – 225)	130	170	340	0.25	10	1200	250
⋆ERZ-C 07DK221U	220 (198 – 242)	140	180	360	0.25	10	1200	250
⋆ERZ-C 07DK241U	240 (216 – 264)	150	200	395	0.25	10	1200	200
⋆ERZ-C 07DK271U	270 (247 – 303)	175	225	455	0.25	12	1200	170
⋆ERZ-C 07DK361U	360 (324 – 396)	230	300	595	0.25	15	1200	130
⋆ERZ-C 07DK391U	390 (351 – 429)	250	320	650	0.25	17	1200	130
⋆ERZ-C 07DK431U	430 (387 – 473)	275	350	710	0.25	20	1200	110
⋆ERZ-C 07DK471U	470 (423 – 517)	300	385	775	0.25	20	1200	100

Note: ⋆-UL approved model

10 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 10DK180	13.5 (.531)	3.6(.142)	7.5 (.295)	16.5 (.650)	1.3(.051)	 D T H φ0.8 (.031 dia.) 3.0max. (.118) 30.0 min. (1.181) W L
ERZ-C 10DK220		3.7(.146)			1.4(.055)	
ERZ-C 10DK270		3.8(.150)			1.5(.059)	
ERZ-C 10DK330		4.0(.157)			1.7(.067)	
ERZ-C 10DK390		4.1(.161)			1.8(.071)	
ERZ-C 10DK470		4.0(.157)			1.7(.067)	
ERZ-C 10DK560		4.1(.161)			1.9(.075)	
ERZ-C 10DK680		4.3(.169)			2.2(.087)	
ERZ-C 10DK820		4.0(.157)			1.6(.063)	
ERZ-C 10DK101		4.1(.161)			1.8(.071)	
ERZ-C 10DK121		4.2(.165)			2.0(.079)	
ERZ-C 10DK151		4.5(.177)			2.2(.087)	
★ERZ-C 10DK201U		4.6(.181)			2.2(.087)	
★ERZ-C 10DK221U		4.7(.185)			2.3(.091)	
★ERZ-C 10DK241U		4.8(.181)			2.4(.094)	
★ERZ-C 10DK271U		5.1(.201)			2.6(.102)	
★ERZ-C 10DK361U	14.0 (.551)	5.7(.224)		17.0 (.669)	3.2(.126)	
★ERZ-C 10DK391U		5.8(.228)			3.4(.134)	
★ERZ-C 10DK431U		6.2(.244)			3.7(.146)	
★ERZ-C 10DK471U		6.5(.256)			4.0(.157)	
★ERZ-C 10DK621U		6.2(.244)			3.8(.150)	
★ERZ-C 10DK681U		6.5(.256)			4.1(.161)	
★ERZ-C 10DK751U		6.8(.268)			4.4(.173)	
★ERZ-C 10DK781U		6.9(.272)			4.5(.177)	
★ERZ-C 10DK821U		7.1(.280)			4.7(.185)	
★ERZ-C 10DK911U		7.6(.299)			5.2(.205)	
★ERZ-C 10DK102U		8.0(.315)			5.6(.220)	
★ERZ-C 10DK112U		8.5(.335)			6.1(.240)	

Note: ★-UL approved model

Standard Products Table

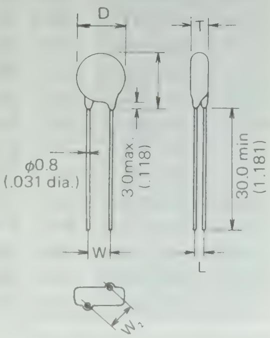
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V_{1mA} (V)	ACrms(V)	DC(V)	V_{5A} (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 10DK180	18 (16 – 20)	11	14	36	0.05	1.5	500	7500
ERZ-C 10DK220	22 (20 – 24)	14	18	43	0.05	2.0	500	6000
ERZ-C 10DK270	27 (24 – 30)	17	22	53	0.05	2.5	500	4000
ERZ-C 10DK330	33 (30 – 36)	20	26	65	0.05	3.0	500	3000
ERZ-C 10DK390	39 (35 – 43)	25	31	77	0.05	3.5	500	2600
ERZ-C 10DK470	47 (42 – 52)	30	38	93	0.05	4.5	500	2200
ERZ-C 10DK560	56 (50 – 62)	35	45	110	0.05	5.5	500	1800
ERZ-C 10DK680	68 (61 – 75)	40	56	135	0.05	6.5	500	1300

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V_{1mA}(V)	ACrms(V)	DC(V)	V_{25A}(V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 10DK820	82 (74– 90)	50	65	135	0.4	8	2500	1800
ERZ-C 10DK101	100 (90– 110)	60	85	165	0.4	10	2500	1400
ERZ-C 10DK121	120 (108– 132)	75	100	200	0.4	12	2500	1100
ERZ-C 10DK151	150 (135– 165)	95	125	250	0.4	16	2500	900
★ERZ-C 10DK201U	200 (185– 225)	130	170	340	0.4	20	2500	500
★ERZ-C 10DK221U	220 (198– 242)	140	180	360	0.4	23	2500	450
★ERZ-C 10DK241U	240 (216– 264)	150	200	395	0.4	25	2500	400
★ERZ-C 10DK271U	270 (247– 303)	175	225	455	0.4	30	2500	350
★ERZ-C 10DK361U	360 (324– 396)	230	300	595	0.4	35	2500	300
★ERZ-C 10DK391U	390 (351– 429)	250	320	650	0.4	40	2500	270
★ERZ-C 10DK431U	430 (387– 473)	275	350	710	0.4	45	2500	250
★ERZ-C 10DK471U	470 (423– 517)	300	385	775	0.4	45	2500	230
★ERZ-C 10DK621U	620 (558– 682)	385	505	1025	0.4	45	2500	130
★ERZ-C 10DK681U	680 (612– 748)	420	560	1120	0.4	45	2500	130
★ERZ-C 10DK751U	750 (675– 825)	460	615	1240	0.4	50	2500	120
★ERZ-C 10DK781U	780 (702– 858)	485	640	1290	0.4	50	2500	120
★ERZ-C 10DK821U	820 (738– 902)	510	670	1355	0.4	55	2500	110
★ERZ-C 10DK911U	910 (819–1001)	550	745	1500	0.4	60	2500	100
★ERZ-C 10DK102U	1000 (900–1100)	625	825	1650	0.4	65	2500	90
★ERZ-C 10DK112U	1100 (990–1210)	680	895	1815	0.4	70	2500	80

Note: ★-UL approved model

14 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 14DK180	17.0 (.669)	3.6(.142)	7.5 (.295)	20.0 (.787)	1.3(.051)	 D T φ0.8 (.031 dia.) 3.0max. (.118) 30.0 min (1.181) W L W₂
ERZ-C 14DK220		3.7(.146)			1.4(.055)	
ERZ-C 14DK270		3.8(.150)			1.5(.059)	
ERZ-C 14DK330		4.0(.157)			1.7(.067)	
ERZ-C 14DK390		4.1(.161)			1.8(.071)	
ERZ-C 14DK470		4.0(.157)			1.7(.067)	
ERZ-C 14DK560		4.1(.161)			1.9(.075)	
ERZ-C 14DK680		4.3(.169)			2.2(.087)	
ERZ-C 14DK820		4.0(.157)			1.6(.063)	
ERZ-C 14DK101		4.1(.161)			1.8(.071)	
ERZ-C 14DK121		4.2(.165)			2.0(.079)	
ERZ-C 14DK151		4.5(.177)			2.2(.087)	
★ERZ-C 14DK201U		4.6(.181)			2.2(.087)	
★ERZ-C 14DK221U		4.7(.185)			2.3(.091)	
★ERZ-C 14DK241U		4.8(.189)			2.4(.094)	
★ERZ-C 14DK271U		5.1(.201)			2.6(.102)	
★ERZ-C 14DK361U	17.5 (.689)	5.7(.224)		20.5 (.807)	3.2(.126)	
★ERZ-C 14DK391U		5.8(.228)			3.4(.134)	
★ERZ-C 14DK431U		6.2(.244)			3.7(.146)	
★ERZ-C 14DK471U		6.5(.256)			4.0(.157)	
★ERZ-C 14DK621U		6.2(.244)			3.8(.150)	
★ERZ-C 14DK681U		6.5(.256)			4.1(.161)	
★ERZ-C 14DK751U		6.8(.268)			4.4(.173)	
★ERZ-C 14DK781U		6.9(.272)			4.5(.177)	
★ERZ-C 14DK821U		7.1(.280)			4.7(.185)	
★ERZ-C 14DK911U		7.6(.299)			5.2(.205)	
★ERZ-C 14DK102U		8.0(.315)			5.6(.220)	
★ERZ-C 14DK112U		8.5(.335)			6.1(.240)	
★ERZ-C 14DK182U		12.0±2.0 (.472±.079)	*15.0 (.591)	22.0 (.866)	9.5±2.0 (.374±.079)	

Note: ★-UL approved model
*-W₂

Standard Products Table

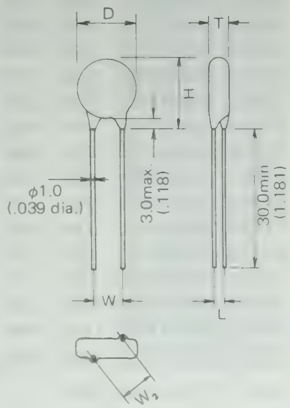
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8×20μsec. 1 time)	Typical Capacitance
	V_{1mA} (V)	ACrms(V)	DC(V)	V_{10A} (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 14DK180	18 (16 – 20)	11	14	36	0.1	3.5	1000	18000
ERZ-C 14DK220	22 (20 – 24)	14	18	43	0.1	4.0	1000	15000
ERZ-C 14DK270	27 (24 – 30)	17	22	53	0.1	5.0	1000	10000
ERZ-C 14DK330	33 (30 – 36)	20	26	65	0.1	6.0	1000	7500
ERZ-C 14DK390	39 (35 – 43)	25	31	77	0.1	7.0	1000	6500
ERZ-C 14DK470	47 (42 – 52)	30	38	93	0.1	8.5	1000	5500
ERZ-C 14DK560	56 (50 – 62)	35	45	110	0.1	10	1000	4500
ERZ-C 14DK680	68 (61 – 75)	40	56	135	0.1	12	1000	3300

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8×20μsec. 1 time)	Typical Capacitance
	V_{1mA} (V)	ACrms(V)	DC(V)	V_{50A} (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 14DK820	82 (74– 90)	50	65	135	0.6	14	4500	2900
ERZ-C 14DK101	100 (90– 110)	60	85	165	0.6	18	4500	2400
ERZ-C 14DK121	120 (108– 132)	75	100	200	0.6	20	4500	1900
ERZ-C 14DK151	150 (135– 165)	95	125	250	0.6	25	4500	1500
★ ERZ-C 14DK201U	200 (185– 225)	130	170	340	0.6	35	4500	1000
★ ERZ-C 14DK221U	220 (198– 242)	140	180	360	0.6	40	4500	1000
★ ERZ-C 14DK241U	240 (216– 264)	150	200	395	0.6	40	4500	900
★ ERZ-C 14DK271U	270 (247– 303)	175	225	455	0.6	50	4500	750
★ ERZ-C 14DK361U	360 (324– 396)	230	300	595	0.6	65	4500	550
★ ERZ-C 14DK391U	390 (351– 429)	250	320	650	0.6	70	4500	500
★ ERZ-C 14DK431U	430 (387– 473)	275	350	710	0.6	75	4500	450
★ ERZ-C 14DK471U	470 (423– 517)	300	385	775	0.6	80	4500	400
★ ERZ-C 14DK621U	620 (558– 682)	385	505	1025	0.6	85	4500	250
★ ERZ-C 14DK681U	680 (612– 748)	420	560	1120	0.6	90	4500	250
★ ERZ-C 14DK751U	750 (675– 825)	460	615	1240	0.6	100	4500	230
★ ERZ-C 14DK781U	780 (702– 858)	485	640	1290	0.6	105	4500	230
★ ERZ-C 14DK821U	820 (738– 902)	510	670	1355	0.6	110	4500	200
★ ERZ-C 14DK911U	910 (819–1001)	550	745	1500	0.6	120	4500	180
★ ERZ-C 14DK102U	1000 (900–1100)	625	825	1650	0.6	130	4500	150
★ ERZ-C 14DK112U	1100 (990–1210)	680	895	1815	0.6	140	4500	150
★ ERZ-C 14DK182U	1800 (1620–1980)	1000	1465	2970	0.6	240	4500	100

Note: ★-UL approved model

20 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 20DK180	23.0 (.906)	4.1(.161)	10.0 (.394)	27.0 (1.063)	1.5(.059)	 D T H φ1.0 (.039 dia.) 3.0max (.118) 30.0min (1.181) W L W₂
ERZ-C 20DK220		4.2(.165)			1.6(.063)	
ERZ-C 20DK270		4.3(.169)			1.7(.067)	
ERZ-C 20DK330		4.5(.177)			1.9(.075)	
ERZ-C 20DK390		4.5(.177)			1.9(.075)	
ERZ-C 20DK470		4.6(.181)			1.9(.075)	
ERZ-C 20DK560		4.7(.185)			2.1(.083)	
ERZ-C 20DK680		4.8(.189)			2.4(.094)	
ERZ-C 20DK820		4.5(.177)			1.8(.071)	
ERZ-C 20DK101		4.6(.181)			2.0(.079)	
ERZ-C 20DK121		4.7(.185)			2.2(.087)	
ERZ-C 20DK151		4.9(.193)			2.4(.094)	
★ERZ-C 20DK201U		5.0(.197)			2.4(.094)	
★ERZ-C 20DK221U		5.2(.205)			2.6(.102)	
★ERZ-C 20DK241U		5.3(.209)			2.7(.106)	
★ERZ-C 20DK271U		5.5(.217)			2.9(.114)	
★ERZ-C 20DK361U	24.0 (.945)	6.2(.244)		28.0 (1.102)	3.5(.138)	
★ERZ-C 20DK391U		6.4(.252)			3.7(.146)	
★ERZ-C 20DK431U		6.7(.264)			4.0(.157)	
★ERZ-C 20DK471U		7.0(.276)			4.3(.169)	
★ERZ-C 20DK621U		6.6(.260)			4.1(.161)	
★ERZ-C 20DK681U		6.9(.272)			4.4(.173)	
★ERZ-C 20DK751U		7.3(.287)			4.8(.189)	
★ERZ-C 20DK781U		7.4(.291)			4.9(.193)	
★ERZ-C 20DK821U		7.6(.299)			5.1(.201)	
★ERZ-C 20DK911U		8.1(.319)			5.6(.220)	
★ERZ-C 20DK102U		8.5(.335)			6.0(.236)	
★ERZ-C 20DK112U		9.0(.354)			6.5(.256)	
★ERZ-C 20DK182U	25.0 (.984)	12.0±2.0 (.472±.079)	*15.0 (.591)	30.0 (1.181)	9.5±2.0 (.374±.079)	

Note: ★-UL approved model
*-W$_2$

Standard Products Table

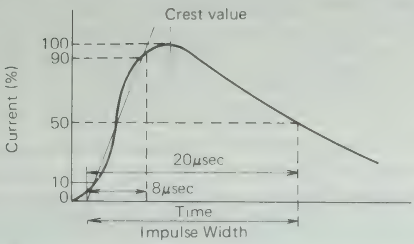
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V1mA(V)	ACrms(V)	DC(V)	V20A(V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 20DK180	18 (16 – 20)	11	14	36	0.2	10	2000	37000
ERZ-C 20DK220	22 (20 – 24)	14	18	43	0.2	13	2000	30000
ERZ-C 20DK270	27 (24 – 30)	17	22	53	0.2	15	2000	22000
ERZ-C 20DK330	33 (30 – 36)	20	26	65	0.2	20	2000	17000
ERZ-C 20DK390	39 (35 – 43)	25	31	77	0.2	24	2000	15000
ERZ-C 20DK470	47 (42 – 52)	30	38	93	0.2	30	2000	13000
ERZ-C 20DK560	56 (50 – 62)	35	45	110	0.2	35	2000	11000
ERZ-C 20DK680	68 (61 – 75)	40	56	135	0.2	40	2000	7000

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy (2ms.)	Withstanding Surge Current (8x20μsec. 1 time)	Typical Capacitance
	V1mA (V)	ACrms(V)	DC(V)	V100A (V)	(W)	(J)	(A)	@1kHz(pF)
ERZ-C 20DK820	82 (74– 90)	50	65	135	1.0	27	6500	5500
ERZ-C 20DK101	100 (90– 110)	60	85	165	1.0	30	6500	4800
ERZ-C 20DK121	120 (108– 132)	75	100	200	1.0	40	6500	3800
ERZ-C 20DK151	150 (135– 165)	95	125	250	1.0	50	6500	3000
★ERZ-C 20DK201U	200 (185– 225)	130	170	340	1.0	70	6500	2000
★ERZ-C 20DK221U	220 (198– 242)	140	180	360	1.0	75	6500	2000
★ERZ-C 20DK241U	240 (216– 264)	150	200	395	1.0	80	6500	1800
★ERZ-C 20DK271U	270 (247– 303)	175	225	455	1.0	90	6500	1600
★ERZ-C 20DK361U	360 (324– 396)	230	300	595	1.0	120	6500	1200
★ERZ-C 20DK391U	390 (351– 429)	250	320	650	1.0	130	6500	1000
★ERZ-C 20DK431U	430 (387– 473)	275	350	710	1.0	140	6500	900
★ERZ-C 20DK471U	470 (423– 517)	300	385	775	1.0	150	6500	900
★ERZ-C 20DK621U	620 (558– 682)	385	505	1025	1.0	150	6500	500
★ERZ-C 20DK681U	680 (612– 748)	420	560	1120	1.0	160	6500	460
★ERZ-C 20DK751U	750 (675 – 825)	460	615	1240	1.0	175	6500	420
★ERZ-C 20DK781U	780 (702– 858)	485	640	1290	1.0	180	6500	420
★ERZ-C 20DK821U	820 (738– 902)	510	670	1355	1.0	190	6500	400
★ERZ-C 20DK911U	910 (819–1001)	550	745	1500	1.0	215	6500	350
★ERZ-C 20DK102U	1000 (900–1100)	625	825	1650	1.0	230	6500	320
★ERZ-C 20DK112U	1100 (990–1210)	680	895	1815	1.0	250	6500	300
★ERZ-C 20DK182U	1800 (1620–1980)	1000	1465	2970	1.0	400	6500	200

Note: ★-UL approved model

Ratings

Electrical Ratings

<table>
<tr><th>Item</th><th>Test Condition/Description</th><th>Requirment</th></tr>
<tr><td>Varistor Voltage</td><td>The voltage between two terminals with the specified measuring current CmA DC applied is called Vc. The measurement shall be made as fast as possible to avoid heat affection.</td><td rowspan="6">To meet the specified value.</td></tr>
<tr><td>Maximum Allowable voltage</td><td>The recommended maximum sine wave voltage (rms) or the maximum DC voltage that can be applied continuously.</td></tr>
<tr><td>Maximum Clamping voltage</td><td>The maximum voltage between two terminals with the specified standard impulse current (8 x 20 μsec.) illustrated below applied.
 </td></tr>
<tr><td>Rated Wattage</td><td>The maximum power that can be applied within the specified ambient temperature.</td></tr>
<tr><td>Energy</td><td>The maximum energy within the varistor voltage change of ±10% when one impulse of 2msec. is applied.
The maximum energy which is figured out as follows.
E = Vm · Im · T
E: Energy
Im: Maximum allowable single surge current of 2ms. (rectangular wave form)
Vm: Maximum clamping voltage at Im
T: Duration of surge current (2ms.)</td></tr>
<tr><td>Withstanding Surge Current</td><td>The maximum current within the varistor voltage change of ±10% with the standard impulse current (8 x 20 μsec.) applied one time.</td></tr>
<tr><td>Varistor voltage Temperature Coefficient</td><td>$\frac{\text{Vc at } 20^\circ\text{C}(68^\circ\text{F}) - \text{Vc at } 70^\circ\text{C}(158^\circ\text{F})}{\text{Vc at } 20^\circ\text{C}/68^\circ\text{F})} \times \frac{1}{50} \times 100(\%/^\circ\text{C})$</td><td>−0.05%/°C max.</td></tr>
<tr><td>Surge Life</td><td>The change of Vc shall be measured after the impulse listed below is applied 10,000 times continuously with the interval of ten seconds at room temperature.
<table>
<tr><td rowspan="2">3 Series</td><td>ERZ-C03DK220 to ERZ-C03DK390</td><td>0.2A (2msec.)</td></tr>
<tr><td>ERZ-C03DK820 to ERZ-C03DK241</td><td>8A (8 x 20μsec.)</td></tr>
<tr><td rowspan="2">5 Series</td><td>ERZ-C05DK180 to ERZ-C05DK680</td><td>0.5A (2msec.)</td></tr>
<tr><td>ERZ-C05DK820 to ERZ-C05DK471</td><td>20A (8 x 20μsec.)</td></tr>
<tr><td rowspan="2">7 Series</td><td>ERZ-C07DK180 to ERZ-C07DK680</td><td>1.5A (2msec.)</td></tr>
<tr><td>ERZ-C07DK820 to ERZ-C07DK471</td><td>50A (8 x 20μsec.)</td></tr>
<tr><td rowspan="2">10 Series</td><td>ERZ-C10DK180 to ERZ-C10DK680</td><td>50A (8 x 20μsec.)</td></tr>
<tr><td>ERZ-C10DK820 to ERZ-C10DK112</td><td>100A (8 x 20μsec.)</td></tr>
</table></td><td>$\frac{\Delta Vc}{Vc} \leqq \pm 10\%$</td></tr>
</table>

Item	Test Condition/Description			Requirement
Surge Life	14 Series	ERZ-C14DK180 to ERZ-C14DK680	75A (8 x 20μ sec.)	$\frac{\Delta Vc}{Vc} \leqq \pm 10\%$
		ERZ-C14DK820 to ERZ-C14DK182	150A (8 x 20μ sec.)	
	20 Series	ERZ-C20DK180 to ERZ-C20DK680	120A (8 x 20μ sec.)	
		ERZ-C20DK820 to ERZ-C20DK182	200A (8 x 20μ sec.)	

Note: The test shall be done in general at 20°C (68°F), 65% RH.

Mechanical Ratings

Item	Test Condition/Description	Requirement
Terminal Pull Strength	After gradually applying the load specified below and keeping the unit fixed for ten seconds, the terminal shall be visually examined for any damage. Terminal diameter — Load 0.6mm (.024") — 0.5kg (1.1lbs.) 0.8mm (.031") — 1.0kg (2.2lbs.) 1.0mm (.039") — 2.0kg (4.4lbs.)	No outstanding damage
Terminal Bending strength	The unit shall be secured with its terminal kept vertical and the weight specified below be applied in the axial direction. The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position. The damage of the terminal shall be visually examined. Terminal diameter — Load 0.6mm (.024") — 0.25kg (0.55lbs.) 0.8mm (.031") — 0.5 kg (1.1 lbs.) 1.0mm (.039") — 1.0 kg (2.2 lbs.)	
Vibration	Subjected to simple harmonic motion of 0.75mm (.029") amplitude — 1.5mm (.058") maximum total excursion — between limits of 10 — 55 Hz. Frequency scan shall be traversed in one minute. This motion shall then be applied for period of two hours in each of three mutually perpendicular directions. Thereafter, the unit shall be visually examined.	
Solderability	After dipping the terminal to a depth of approximately 3mm (.118") from the body in a soldering bath of 260°C (500°F) for three seconds, the terminal shall be visually examined.	Almost all the surface should be covered with solder uniformly.
Resistance to Soldering Heat	The terminal shall be dipped into a soldering bath having a temperature of 350°C (660°F) to a point 3mm (.118") from the body of the unit and then be held there for three seconds. The change of Vc and mechanical damage shall be examined. (270°C(518°F) 3 seconds for 3 series)	$\Delta VcmA/VcmA \leqq 5\%$ No outstanding damage

Environmental Ratings

<table>
<tr><th>Item</th><th>Test Condition/Description</th><th>Requirement</th></tr>
<tr><td>High Temperature Storage</td><td>The specimen shall be subjected to 125°C (257°F) for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.</td><td rowspan="3">$\frac{\Delta Vc}{Vc} \leqq \pm 5\%$</td></tr>
<tr><td>Humidity</td><td>The specimen shall be subjected to 40°C (104°F), 90 to 95% R.H. for 1000 hours without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.</td></tr>
<tr><td>Thermal Shock</td><td>The temperature cycle shown below shall be repeated five times and then stored at room temperature and humidity for one to two hours. The change of Vc as well as mechanical damage shall be examined.
<table>
<tr><th>Step</th><th>Temperature</th><th>Period</th></tr>
<tr><td>1</td><td>−25°C(−13°F)</td><td>30 minutes</td></tr>
<tr><td>2</td><td>85°C(185°F)</td><td>30 minutes</td></tr>
</table></td></tr>
<tr><td>High Temperature Operation</td><td>After being continuously applied the maximum allowable voltage at 85°C (185°F) for 1000 hours, the specimen shall be stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.</td><td>$\frac{\Delta Vc}{Vc} \leqq \pm 10\%$</td></tr>
</table>

Suggestions for Handling

1. In case of the line to ground use, attention should be paid for following points.
   - A. When the insulation resistance test of the equipment employing the ZNR is conducted, the ZNR should be removed after getting approval from the customer so that leakage current of the ZNR generated by megatest voltage may not be confused with the insulation resistance deterioration of the equipment or the ZNR with the maximum allowable voltage exceeding the megatest voltage should be employed.
   - B. When the withstanding voltage test is conducted, the ZNR should be removed or the ZNR with the maximum allowable voltage in excess of the test voltage should be employed.
   - C. In a single phase, three-wire distribution system, an excessive load may be applied on the neutral wire when a wire is grounded. It is recommended, therefore, to employ following ZNRs in line to ground use.

Circuit Voltage (VAC)	120	220	380
Recommended ZNR Max. Allowable Volt. (VAC)	275 or 300		460

2. When the ZNR is used in high frequency circuits, heat generation must be avoided taking its electrostatic capacitance and dielectric loss angle into account.
3. A voltage exceeding the specified maximum allowable voltage should not be applied.
4. A surge in excess of the specified withstanding surge current may cause short circuits or mechanical breakdown. It is recommended, therefore, that a fuse listed below be put in series or the ZNR be used in a protective box.

   Recommended fuse

Withstanding surge current (A)	500	1,000	2,000	5,000	Over 10,000
Fuse (A)	3	5	10	20	Over 30

5. The ZNR should not be used near heat generating devices and be free from direct sunlight.
6. The ZNR should be free from dust, metal powder, rain, dew and sea wind. A protective box is recommended to prevent the unit from such.

Part Number Code

E R Z – C	□ □	□	□	□ □ □	□
Common Code	Element Dia.	Type	Tolerance	Varistor Voltage	Suffix

Element Dia.

05	ϕ 5mm	(.197″)
07	ϕ 7mm	(.276″)
10	ϕ10mm	(.394″)
14	ϕ14mm	(.551″)
20	ϕ20mm	(.787″)

Type

D	Type D

Tolerance

K	±10%

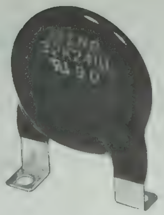
Varistor Voltage

The first two digits are significant figures and the third one denotes the number of zeros following. Decimal point is expressed by R.

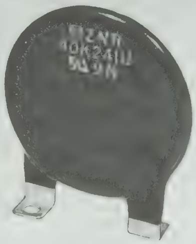
"ZNR®" Transient/Surge Absorber with Tabs

32 series & 40 series

ZNR Transient/Surge Absorber with Tabs is a heavy duty type ZNR with very unique tab terminals which bring forth a higher reliability.
These tabs are used as electrical connecting terminals and also its mounting legs.
This ZNR is meant for application in power supplyers or transient voltage surge suppressor units where high surge current or high surge energy absorption is required.



32 series



40 series

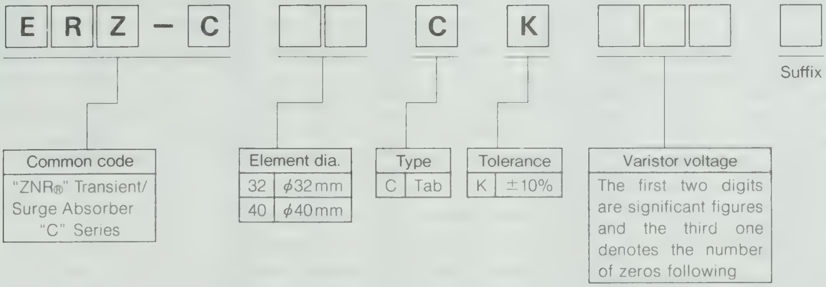
■Features

- High energy handling capability (210 to 710 joules).
- Large withstanding surge current (25 to 30 kA).
- Compact size.
- Common terminals for electrical connection and mounting.
- UL recognized
  (UL 1449 Transient Voltage Surge Suppressors).

■Applications

- Power suppliers for OA, FA, telecommunication and industrial equipment.
- Power strips.
- Transient voltage surge suppressor units.

■Part Number Code



Common code
"ZNR®" Transient/ Surge Absorber "C" Series

Element dia.	
32	ϕ32 mm
40	ϕ40 mm

Type	
C	Tab

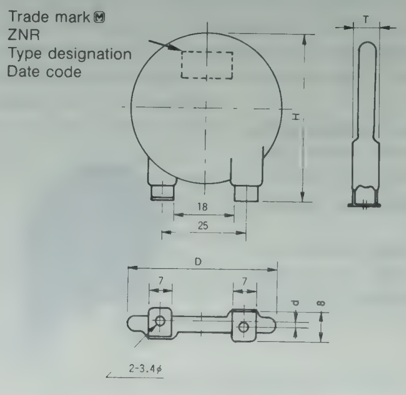
Tolerance	
K	±10%

Varistor voltage
The first two digits are significant figures and the third one denotes the number of zeros following

“ZNR®” Transient/Surge Absorber with Tabs

■Dimensions

Unit : mm



■Dimensions

Part number	Type designation	D max.	H max.	T max.	d±1
ERZ-C32CK201B	32K201U	36	46	7.5	5.7
ERZ-C40CK201B	40K201U	44	50		
ERZ-C32CK241B	32K241U	36	46	7.5	5.4
ERZ-C40CK241B	40K241U	44	50		
ERZ-C32CK271B	32K271U	36	46	8.5	5.2
ERZ-C40CK271B	40K271U	44	50		
ERZ-C32CK361B	32K361U	36	46	9.0	4.6
ERZ-C40CK361B	40K361U	44	50		
ERZ-C32CK391B	32K391U	36	46	9.0	4.4
ERZ-C40CK391B	40K391U	44	50		
ERZ-C32CK431B	32K431U	36	46	9.0	4.1
ERZ-C40CK431B	40K431U	44	50		
ERZ-C32CK441B	32K441U	36	46	9.0	4.1
ERZ-C40CK441B	40K441U	44	50		
ERZ-C32CK511B	32K511U	36	46	9.7	4.5
ERZ-C40CK511B	40K511U	44	50		
ERZ-C32CK621B	32K621U	36	46	9.7	3.9
ERZ-C40CK621B	40K621U	44	50		
ERZ-C32CK681B	32K681U	36	46	9.7	3.6
ERZ-C40CK681B	40K681U	44	50		
ERZ-C32CK751B	32K751U	36	46	10.5	3.3
ERZ-C40CK751B	40K751U	44	50		
ERZ-C32CK781B	32K781U	36	46	10.5	3.1
ERZ-C40CK781B	40K781U	44	50		
ERZ-C32CK821B	32K821U	36	46	10.5	2.9
ERZ-C40CK821B	40K821U	44	50		
ERZ-C32CK881B	32K881U	36	46	11.5	2.4
ERZ-C40CK881B	40K881U	44	50		
ERZ-C32CK911B	32K911U	36	46	11.5	2.3
ERZ-C40CK911B	40K911U	44	50		
ERZ-C32CK951B	32K951U	36	46	11.5	2.3
ERZ-C40CK951B	40K951U	44	50		

■Ratings

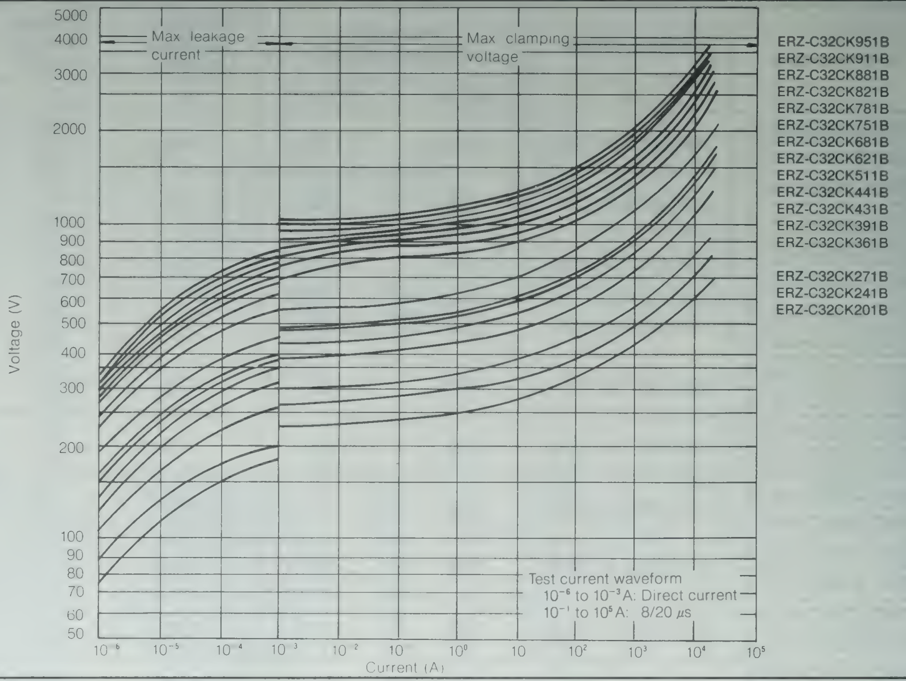
Part number	Varistor voltage	Maximum allowable voltage		Maximum clamping at I (A)※	Energy 1 shot (2 ms)	Withstanding current, 1 shot 8/20μs
	(V)	AC (V)	DC (V)	(V)	(J)	(kA)
ERZ-C32CK201B	200 (185 to 225)	130	170	340	210	25
ERZ-C40CK201B					260	30
ERZ-C32CK241B	240 (216 to 264)	150	200	395	240	25
ERZ-C40CK241B					300	30
ERZ-C32CK271B	270 (247 to 303)	175	225	455	255	25
ERZ-C40CK271B					340	30
ERZ-C32CK361B	360 (324 to 396)	230	300	595	325	25
ERZ-C40CK361B					405	30
ERZ-C32CK391B	390 (351 to 429)	250	320	650	350	25
ERZ-C40CK391B					435	30
ERZ-C32CK431B	430 (387 to 473)	275	350	710	400	25
ERZ-C40CK431B					500	30
ERZ-C32CK441B	440 (396 to 484)	280	355	730	400	25
ERZ-C40CK441B					500	30
ERZ-C32CK511B	510 (459 to 561)	320	415	845	405	25
ERZ-C40CK511B					505	30
ERZ-C32CK621B	620 (558 to 682)	385	505	1025	415	25
ERZ-C40CK621B					515	30
ERZ-C32CK681B	680 (612 to 748)	420	560	1120	450	25
ERZ-C40CK681B					560	30
ERZ-C32CK751B	750 (675 to 825)	460	615	1240	500	25
ERZ-C40CK751B					625	30
ERZ-C32CK781B	780 (702 to 858)	485	640	1290	520	25
ERZ-C40CK781B					650	30
ERZ-C32CK821B	820 (738 to 902)	510	670	1355	545	25
ERZ-C40CK821B					680	30
ERZ-C32CK881B	880 (792 to 968)	505	710	1455	580	25
ERZ-C40CK881B					725	30
ERZ-C32CK911B	910 (819 to 1001)	550	745	1500	600	25
ERZ-C40CK911B					750	30
ERZ-C32CK951B	950 (855 to 1045)	575	765	1570	600	25
ERZ-C40CK951B					750	30

Operating temperature range : −40 to 85℃
Storage temperature range : −40 to 125℃

※32 series I=200A
※40 series I=250A

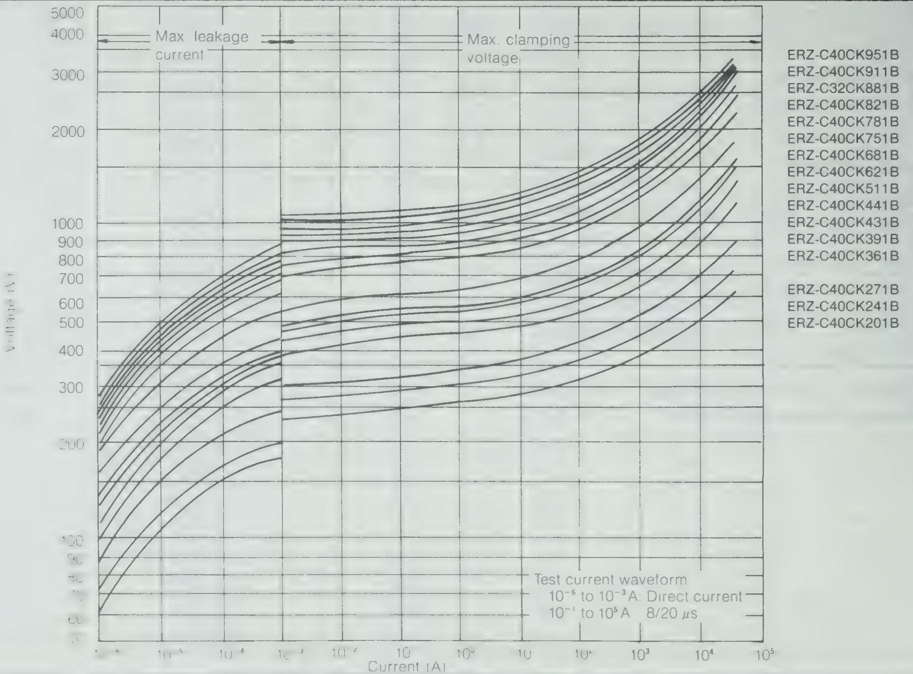
32 series

V-I curve

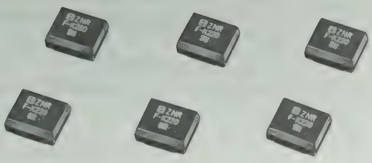


40 series

V-I curve



"ZNR®" Transient/Surge Absorbers, Chip Type Type ERZ-CF



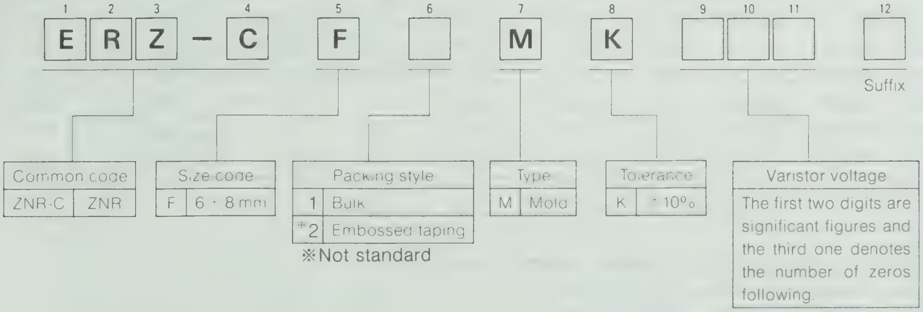
Features

- Flow soldering and reflow soldering are possible.
- Excellent response against high steep surge voltage
- Compact package with large withstanding surge capability.
- Low clamping voltage for better protection.

Applications

- Protection of various kinds of semiconductors.
- Protection of consumer equipment.
- Protection of industrial equipment.
- Protection of telephone and telecommunication systems.
- Absorption of switching surge from various kinds of relays.
- Protection of electronic equipment from electrostatic discharge.

■Part Number Code



Common code	
ZNR-C	ZNR

Size code	
F	6 · 8 mm

Packing style	
1	Bulk
*2	Embossed taping

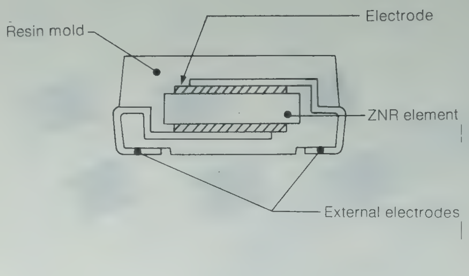
※Not standard

Type	
M	Mold

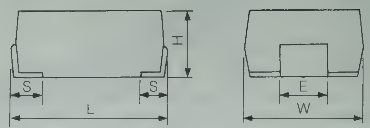
Tolerance	
K	±10%

Varistor voltage
The first two digits are significant figures and the third one denotes the number of zeros following.

■Construction



■Dimensions



Unit : mm

Size code	W	L	H	S	E
F	6±0.4	8±0.5	3.2±0.3	1.3±0.3	2.5±0.2

■Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage*	Rated Wattage	Energy (2ms)	Withstanding Surge Current (8/20μs, 2times)
	$V_{0.1mA}$ (V)	ACrms (V)	DC (V)	V_{xA} (V)	(W)	(J)	(A)
ERZ-CF1MK220	22 (20~24)	14	18	48	0.01	0.4	50
ERZ-CF1MK270	27 (24~30)	17	22	60	0.01	0.5	50
ERZ-CF1MK330	33 (30~36)	20	26	73	0.01	0.6	50
ERZ-CF1MK390	39 (35~43)	25	31	86	0.01	0.8	50
ERZ-CF1MK470	47 (42~52)	30	38	104	0.01	1.0	50
ERZ-CF1MK560	56 (50~62)	35	45	123	0.01	1.0	50
ERZ-CF1MK680	68 (61~75)	40	56	150	0.01	1.2	50
ERZ-CF1MK820	82 (74~90)	50	65	145	0.1	1.7	200
ERZ-CF1MK101	100 (90~110)	60	85	175	0.1	2.0	200
ERZ-CF1MK121	120 (108~132)	75	100	210	0.1	2.5	200
ERZ-CF1MK151	150 (135~165)	95	125	260	0.1	3.0	200
ERZ-CF1MK201	200 (185~225)	130	170	355	0.1	4.0	200
ERZ-CF1MK221	220 (198~242)	140	180	380	0.1	4.5	200
ERZ-CF1MK241	240 (216~264)	150	200	415	0.1	5.0	200
ERZ-CF1MK271	270 (247~303)	175	225	475	0.1	6.0	200
ERZ-CF1MK361	360 (324~396)	230	300	620	0.1	6.0	200
ERZ-CF1MK391	390 (351~429)	250	320	675	0.1	6.0	200
ERZ-CF1MK431	430 (387~473)	275	350	745	0.1	6.3	200
ERZ-CF1MK471	470 (423~517)	300	385	810	0.1	7.0	200

Packing style Code : "1" for bulk, "2" for taped version.

- Temperature characteristics of varistor voltage : 0~−0.05%/°C
- Operating temperature range : −40 to 85°C
- Storage temperature range : −40 to 125°C

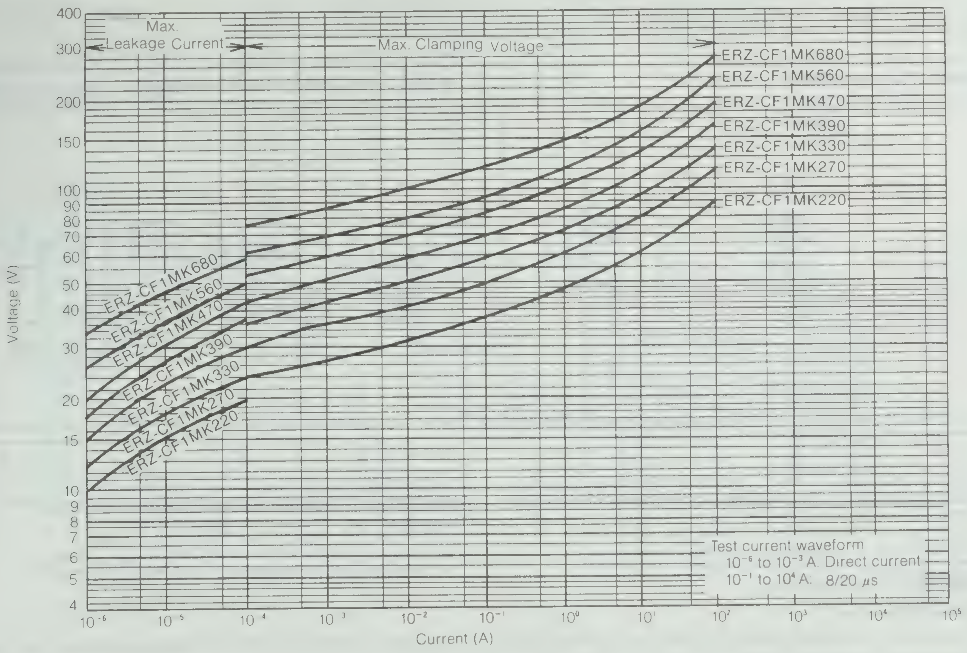
Notes: ∗ ; Varistor voltage 22 to 68V, xA = 1A, Varistor voltage 82 to 470V, xA = 5A

■Specifications

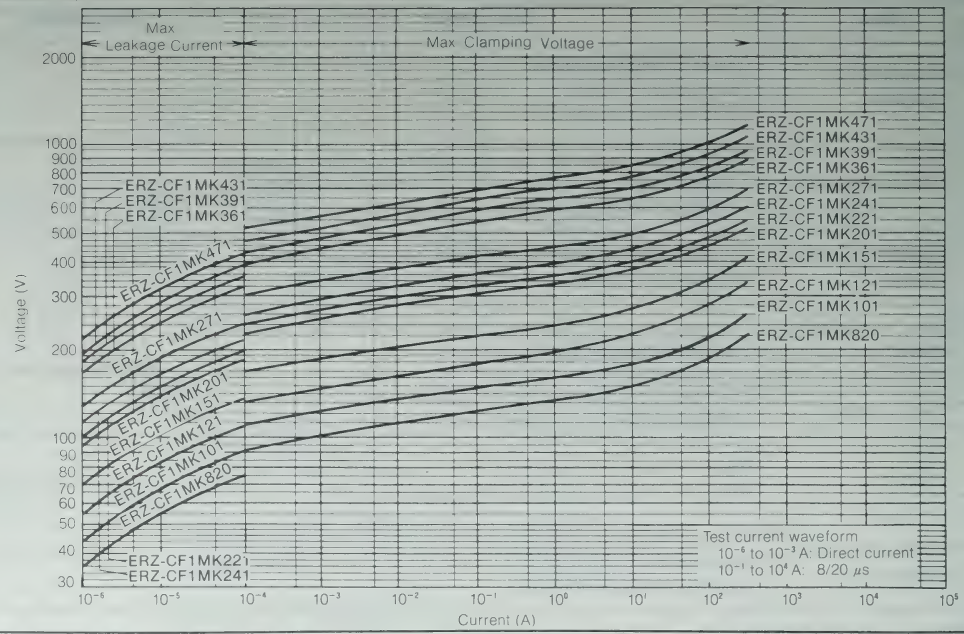
Item		Test Method	Requirement
	Standard test condition	Unless otherwise specified. Temperature: 5~35°C Relative humidity: 45~85% RH	
Electrical	Varistor voltage	The voltage between two terminals with the specified measuring current cmA DC applied is called V_C. The measurement shall be made as fast as possible to avoid heat affection.	To meet the specified value.
	Maximum allowable voltage	The recommended maximum sine wave voltage (rms) or the maximum DC voltage that can be applied continuously.	
	Maximum clamping voltage	The maximum voltage between two terminals with the specified impulse current (8/20μs)	
	Rated wattage	The maximum power that can be applied within the specified ambient temperature of 85±2°C for 1000hours, continously.	
	Energy	Maximum energy at less than ±10% of varistor voltage change when the specified impulse (2ms) is applied, 1 time.	
	Withstanding surge current	Maximum current at less than ±10% of varistor voltage change when impulse current (8/20μs) is applied 2 times continuously with the interval of 5 minutes.	

■Typical Characteristics

V-I Curve (ERZ-CF1MK220~ERZ-CF1MK680)



V-I Curve (ERZ-CF1MK820~ERZ-CF1MK471)

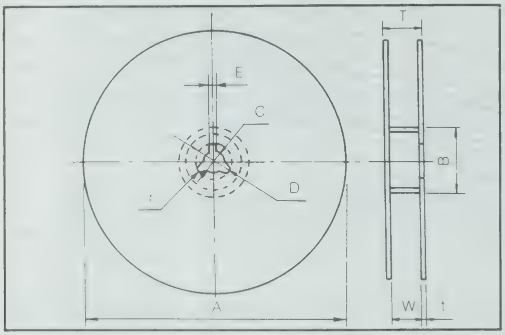


Packaging

- Packing quantiy

Size code	Thickness (mm)	Style: Embossed tape (Not standard)	Bulk
"F"	3.2±0.3	2000 pcs/reel	200 pcs/pack

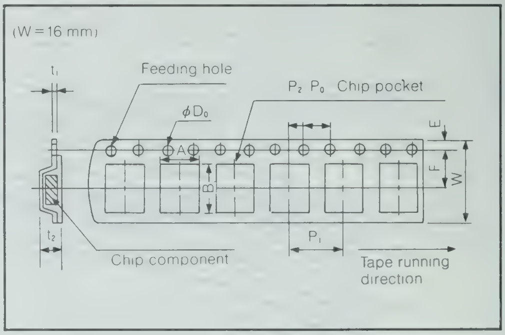
- Reel (Not standard)



Symbol	A	B	C	D	E
Dim. (mm)	382 max.	50 min.	13±0.5	21±0.8	2.0±0.5

Symbol	W	T	t	r
Dim. (mm)	$16.4^{+2.0}_{0}$	22.4 max.	2.5±0.5	1.0

- Embossed taping (Not standard)



Symbol	A	B	W	F	E	P_1
Dim. (mm)	6.8 max.	11.9 max.	16	7.5	1.75	8

Symbol	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	2.0	4.0	1.5	0.6 max.	6.5 max.

Suggestions for handling

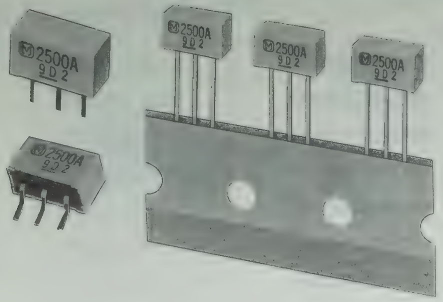
1. Mounting

1) Pressure to the product at picking up and off by mounting machine should be 1 kg max. with ϕ2.5 mm of edge shaped.

2) Circuit board and mold package should be fixed by adhesive resin at mounting.

Ceramic Resonators, Built-In Capacitors Type

Type EFO-GC



This ceramic resonator, Built-In Capacitors Type, includes two capacitors, constructing Colpitts oscillation circuits.
High accuracy and stable characteristics will be realized with the selected capacitors encased, featuring small in size due to the new design of construction.

Features

- Wide range of oscillation frequency: 2 to 35MHz.
- No need of capacitors in oscillation circuit.
- High accuracy, high stability
  Initial frequency tolerance: ±0.3% (EFO-GC□□□4A3□)
  Temperature drift: ±0.1% max, −10 to 60°C
- Saves height on P.C.-board (Hight: 5mm max.)
- Radial tape version is available for automatic insertion.

Applications

- Clock generator for various micro-processers
- Carrier between telecommunication equipments. (telephone to telephone, personal computer to printer etc.)

■ Part Number Code

E F O − G C □□□□ □ □ □

Suffix

Common Code	
EFO	Ceramic Resonator

Type	
GC	Capacitor Built-in Type

Nominal Oscillation Frequency	
4004	4.0MHz
1805	18.0MHz

(Example)

Packing	
A	Bulk
C	Bulk (Over 8MHz)
*T	Radial Taped Type

∗Not standard

Frequency Tolerance	
*1	±0.1%
*2	±0.2%
*3	±0.3%
4	±0.5%
*5	±1.0%

∗Not standard

Ceramic Resonators (Built-In Capacitors Type)

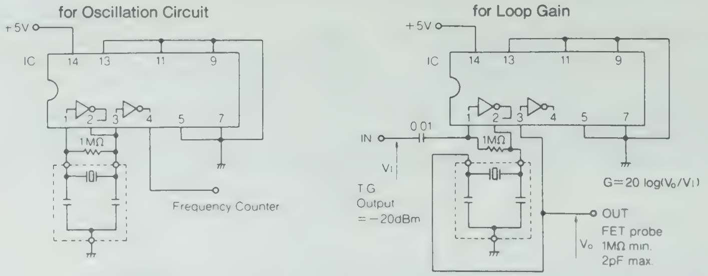
■Standard Products

Part No. \ Item	Oscillation Frequency	Loop Gain (G)	Temperatune Characteristics	Frequency Drift
EFO-GC3004A4	3.0 MHz±0.5%	+6dB min.	Maximum Frequency Drift: ±0.1% max. at −10 to 60°C	0.3% max./ 10 years
EFO-GC3584A4	3.58MHz±0.5%			
EFO-GC4004A4	4.0 MHz±0.5%			
EFO-GC4194A4	4.19MHz±0.5%			
EFO-GC5004A4	5.0 MHz±0.5%			
EFO-GC6004A4	6.0 MHz±0.5%			
EFO-GC8004A4	8.0 MHz±0.5%			
EFO-GC1005C4	10.0 MHz±0.5%			
EFO-GC1205C4	12.0 MHz±0.5%			
EFO-GC1805C4	18.0 MHz±0.5%			
EFO-GC2505C4	25.0 MHz±0.5%			
EFO-GC3205C4	32.0 MHz±0.5%			

- Operating Temperature Range: −20 to 60°C

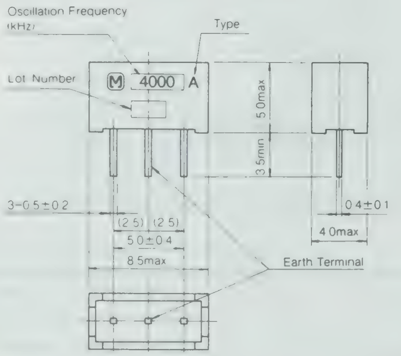
Notes:
- Also available are types other than above standard products in the frequency range of 2 to 35MHz. Please contact us for more information.
- Also other frequency tolerances are available: ±0.1, ±0.2, ±0.3 and ±1.0%.
- For application in telephone dialer, please contact us.

■Standard Measuring Circuit



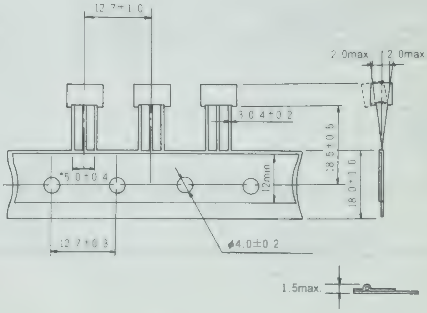
Frequency	IC
2~8MHz	μPD 4069UEC
8.1~35MHz	μPD 74HCU04

■Dimensions



(Unit:mm)

■Dimensions for Taping



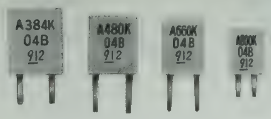
(Unit : mm)

Ceramic Resonators, Case Type

Type K

(380 to 820 kHz)

EFO-A□□□K□□□



The case type ceramic resonator employs area vibration mode of piezoelectric ceramics (PCM®): it is constructed such that the piezoelectric element is press fitted and held between the electrode plates, the entire unit is protected with a case and the case opening is sealed with resin.
Since the oscillation frequency is determined according to the piezoelectric ceramics size, the product size differs depending on the oscillation frequency.
The manufacturable frequency range for this type is 380 to 820kHz.

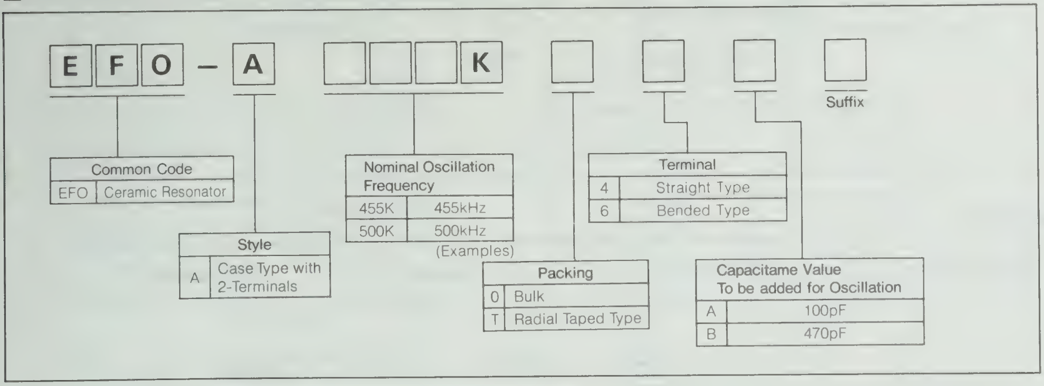
Features

- Range of oscillation frequency: 380 to 820 kHz.
- Standard frequency tolerance: ±0.5%.
- Stable performances against various environmental tests.
- Temperature stable: Max. oscillation frequency drift: ±0.3%, −20 to 80°C
- Solvent cleaning method is applicable.

Applications

- Clock generation for various remotecontrol systems.
- Clock generation for micro-processers used in home appliances,such as washing machines, electric ovens etc.

■ Part Number Code



Common Code	
EFO	Ceramic Resonator

Style	
A	Case Type with 2-Terminals

Nominal Oscillation Frequency	
455K	455kHz
500K	500kHz

(Examples)

Packing	
0	Bulk
T	Radial Taped Type

Terminal	
4	Straight Type
6	Bended Type

Capacitame Value To be added for Oscillation	
A	100pF
B	470pF

Ceramic Resonators (Case Type)

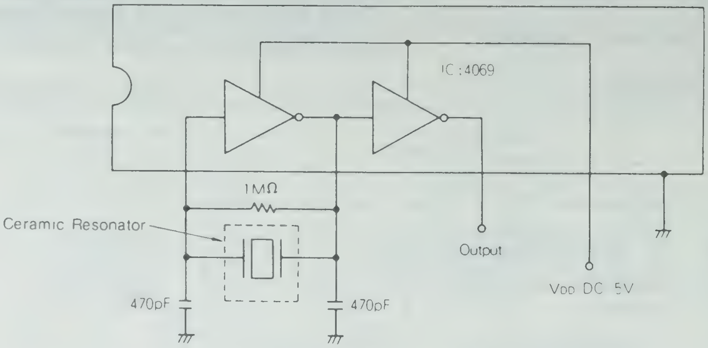
■Standard Products

Item / Part Number	Oscillation Frequency	Frequency Tolerance	Resonant Resistance
EFO-A400K04B	400kHz	±0.5%	20Ωmax.
EFO-A420K04B	420kHz		
EFO-A455K04B	455kHz		
EFO-A480K04B	480kHz		
EFO-A500K04B	500kHz		30Ωmax.
EFO-A540K04B	540kHz		50Ωmax.
EFO-A640K04B	640kHz		
EFO-A800K04B	800kHz		150Ωmax.

- Operating Temperature Range: −20 to 80°C
- Temperature Characteristics: Max. oscillation frequency drift is ±0.3% of the value at 25°C over the temperature range of −20 to 80°C

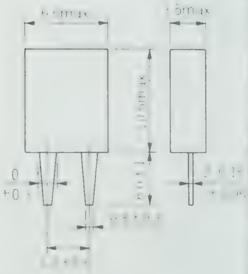
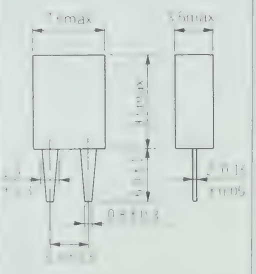
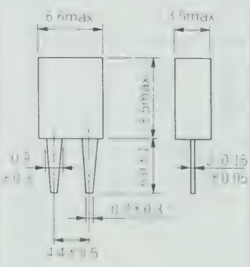
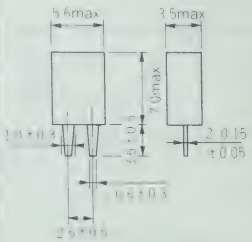
Notes: 1. Other types than above standard products are also available within the range of 380 to 820kHz, upon request.
2. The tolerance of oscillation frequency is our standard; however, non-standard types with other frequency tolerances can be produced, if required. Please contact us for more information.

■Standard Oscillation Circuit

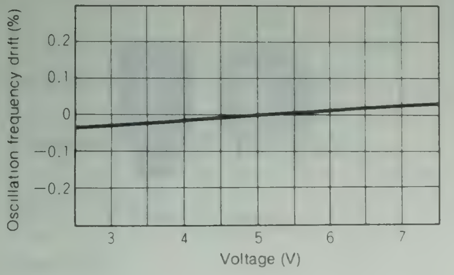


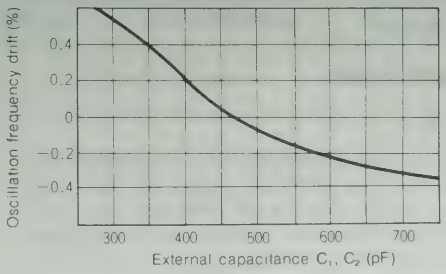
■ Dimensions

Unit: mm

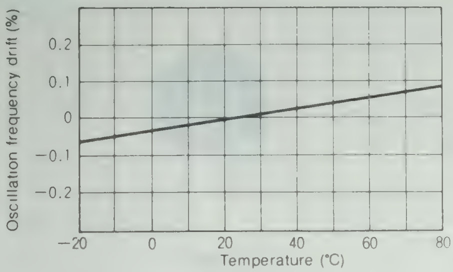
380〜420kHz	420〜520kHz	520〜699kHz	700〜820kHz
			

Stability (EFO-A455K04B)


Oscillation frequency vs.Input voltage

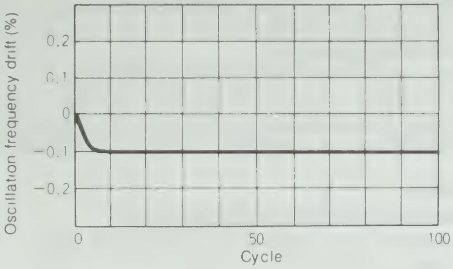

Oscillation frequency vs.External capacitance

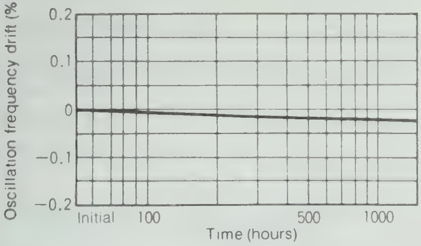
Typical Environmental Characteristics (EFO-A455KO4B)

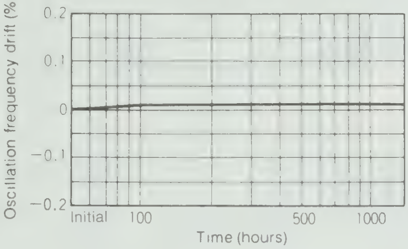

Temperature characteristics

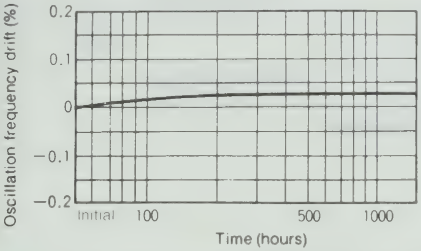
Temperature cycle

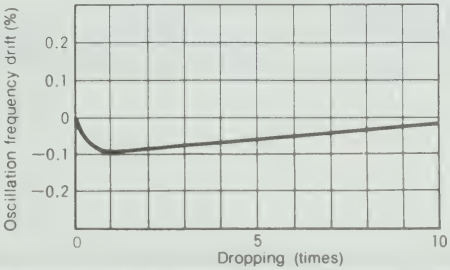
(−40℃: 30 minutes, normal temp.: 5 minutes
+80℃: 30 minutes, normal temp.: 5 minutes)




Dry heat (+80°C)


Cold (−40°C)


Damp heat (+40°C, 90～95%RH)


Shock (1m)

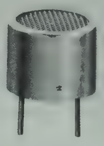
Ultrasonic Ceramic Microphones

Standard Type/For General Purpose

Type/S/U/T

Enclosed Type

Type Q


Type-S/U

Type-T

This ultrasonic ceramic microphone with a completely new structure has been developed for use on a proximity switch used for an automatic door and parking meter, flow rate detector,and a wirelees remote-control device including a TV remote-control unit.

Since this resonant microphone consisting of a disc ceramic vibrator and conical aluminum resonator is high in sensitivlty and has an outstanding selectivity,it assures a greater operating distance when used for a remote-control unit,and maloperation can be readily prevented.

Features

- High output S.P.L.: 110dB min.
- High sensitivity: -45dB min.
- Excellent temperature and humidity durability
- Small in size.
- Applicable to multi-function remote control system because of its wide bandwith.

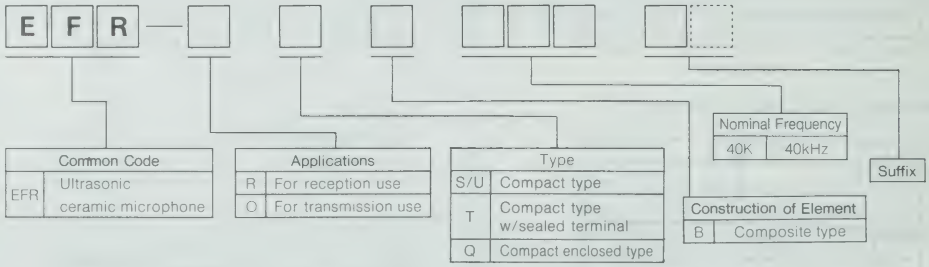
Type-Q

Applications

Ultrasonic wave transmitter and receiver for;

- Remote control equipments for such as TV,room cooler and garage-door opener etc.
- Proximity switch for burglar alarm system,parking meter and automatic door opener etc.

■ Part Number Code



Common Code	
EFR	Ultrasonic ceramic microphone

Applications	
R	For reception use
O	For transmission use

Type	
S/U	Compact type
T	Compact type w/sealed terminal
Q	Compact enclosed type

Construction of Element	
B	Composite type

Nominal Frequency	
40K	40kHz

Suffix

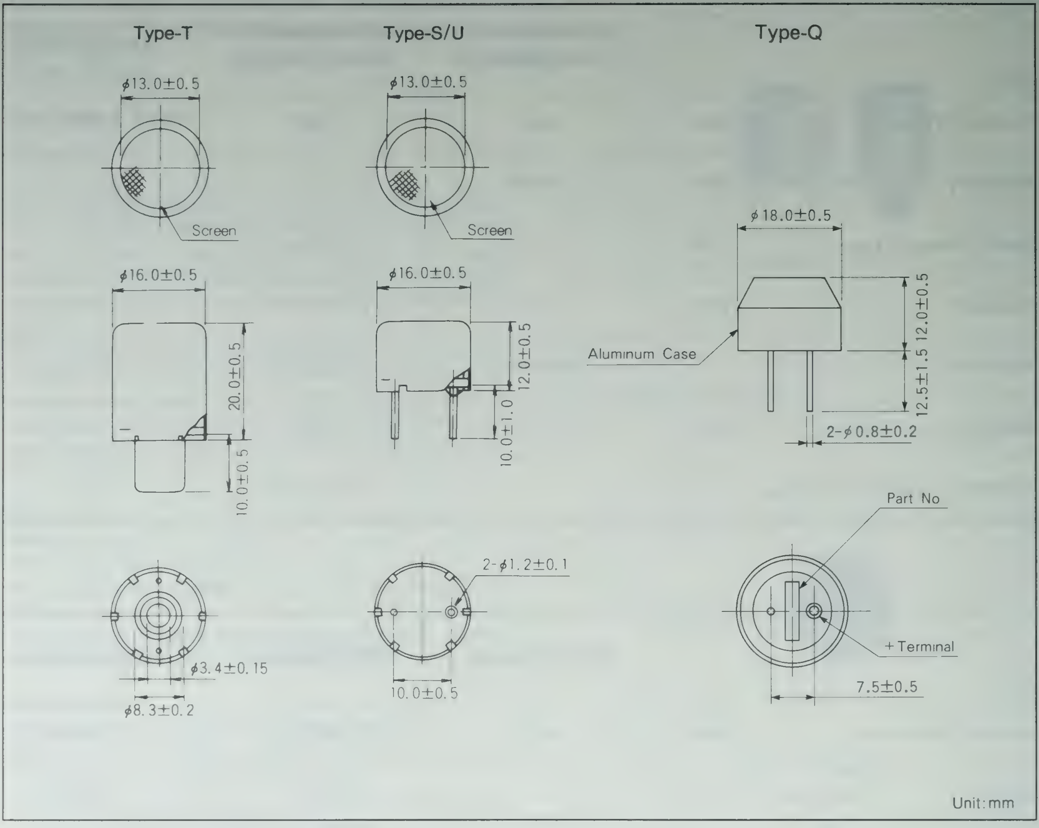
■Standard Products

Part No. / Item	EFR-RSB40K2 EFR-RUB40K22	EFR-OSB40K2 EFR-OUB40K22	EFR-RTB40K2
Nominal Frequency (kHz)	40.0	40.0	40.0
Sensitivity (dB) (0dB=1V/Pa*)	−45 min.	——	−50 min.
Sound Pressure Level (dB)	——	110 min.	——
Bandwidth (kHz)	4.0 min.	4.0 min.	4.0 min.
Application	Receiver	Transmitter	Receiver
Maximum Input Voltage (Vrms)	——	20	——
Operating Temperature Range (℃)	−20 to 60		

Part No. / Item	EFR-OTB40K2	EFR-OQB40K4	EFR-RQB40K4
Nominal Frequency (kHz)	40.0	40.0	40.0
Sensitivity (dB) (0dB=1V/Pa*)	——	——	−55 min.
Sound Pressure Level (dB)	105 min.	105 min.	——
Bandwidth (kHz)	4.0 min.	2.0 min.	2.0 min.
Application	Transmitter	Transmitter	Receiver
Maximum Input Voltage (Vrms)	20	20	——
Operating Temperature Range (℃)	−20 to 60		

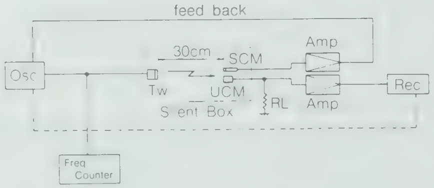
Note: ∗1Pa=10μbar

■Dimensions



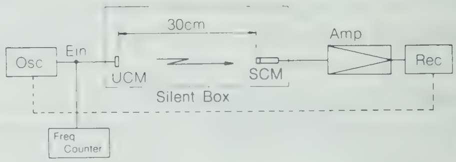
■Measuring Circuits

Measuring Circuit for Receiver



RL : 3.9kΩ
UCM : ULTRASONIC CERAMIC MICROPHONE
SCM : STANDARD CONDENSER MICROPHONE Bruel & Kjær 4135
Amp : AMPLIFIER Bruel & Kjær 2606
Osc : OSCILLATOR Bruel & Kjær 1013
Rec : RECORDER Bruel & Kjær 2305
Tw : TWEETER

Measuring Circuit for Transmitter



UCM : ULTRASONIC CERAMIC MICROPHONE
SCM : STANDARD CONDENSER MICROPHONE Bruel & Kjær 4135
Amp : AMPLIFIER Bruel & Kjær 2606
Osc : OSCILLATOR Bruel & Kjær 1013
Rec : RECORDER Bruel & Kjær 2305
Ein : 10 Vrms.

■Specifications (Standard Type)

Item		Test Method	Requirements
Electrical	Sensitivity	Sensitivity at center frequency when measured in accordance with specified measuring circuit.	To meet the specified value
	Bandwidth	Bandwidth at frequency where sensitivity is −50dB when measured in accordance with the specified measuring circuit.	To meet the specified value
	Temperature Characteristics	Specimen shall be stored at −20℃ and 60℃ respectively for 30 minutes and measured soon after it is taken from the constant temperature chamber. The readings shall then be compared with that at +20℃.	Sensitivity drop : 10.0dB max.
Environmental/Mechanical	Damp Heat (Steady state)	Specimen shall be stored at 40±2℃, 90〜95%RH for 100 hours and then kept at normal temperature and humidity for 24 hours before measurement.	Sensitivity drop : 3.0dB max.
	Shock	Speciman shall be measured after impact of 50G is applied as follows : Direction : 3 perpendicular directions Time : 3 times per direction	Sensitivity drop : 3.0dB max. Bandwidth : To meet the specified value
	Vibration	The specified single harmonic vibration shall be applied to the speciman,to each of three perpendicular directions for 1 hours (for totals of 3 hours). ●Amplitude :0.75mm/single (1.5mm/double) ●Sweep frewuency and its inteval : 10Hz-55Hz-10Hz with duration of 1 minute.	Sensitivity drop : 3.0dB max. Bandwidth : To meet the specified value

Prohibitions for Handling

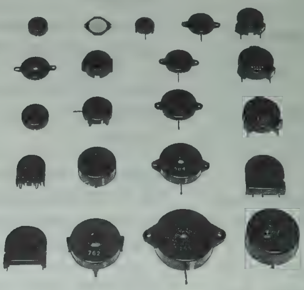
1. DC voltage
   DC voltage must not be applied because insulation resistance may deteriorate.
2. Usage Range
   Because the microphone is designed for use in the air,it can not be used under the water or others.

Suggestions for Handling

1. Characteristics change woing to load impedance
   Center frequency and sensitivity change in accordance with load impedance.
   Therefore,the load characteristics chart should be taken into consideration in designing circuit.
2. Microphones for transmitting use
   Specifications of microphone for transmitting use are prescribsd in convenience on the assumption thet they are used as receivers,but their construtions are different from these for receivers.
   Theredy they should be used as transmitters only.
3. Directivity
   Please be careful enough in deciding the facing position of microphones because of directivity.
4. Terminal connection
   The microphone is sealed after connecting a metal case and a ground terminal.
   Full attention should be paid to the terminal, polarity and connecting method.
5. When used as a transmitter,oscillation may not be taken near the resonant frequency. Please note that the resonant resistance of the microphone is very low as 500Ω.
6. It is advisable to cover a case by means of rubber sheet or other cushions.

Piezoelectric Sounder

Type EFB-R/R□/A□/B□



The piezoelectric sounder consisting of piezoelectric ceramic buzzer element enclosed in a housing, is designed to obtain an efficient acoustic effect and convenient mounting.
The units are suitable for mounting on P.C. board.

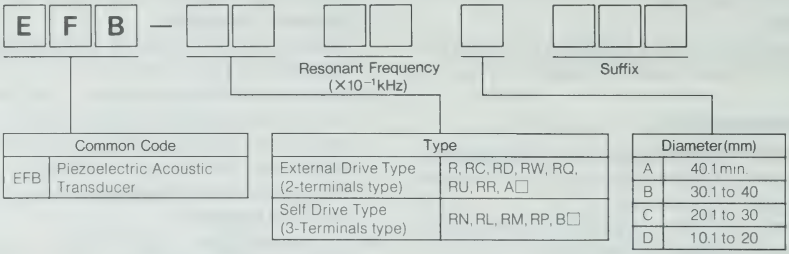
Features

- Low power consumption.
- Long life and no-noise due to non-contact.
- No magnetic field is generated.
- Thin in thickness, and space saving.
- High sound pressure level.
- Covering wide frequency range.

Applications

- Home electric equipment, clook, toy.
- OA equipment calculator, camera.
- For alarm.(Gas leakage detector,Smoke detector etc.)
- For telephone ringer.

■ Part Number Code



Common Code	
EFB	Piezoelectric Acoustic Transducer

Type	
External Drive Type (2-terminals type)	R, RC, RD, RW, RQ, RU, RR, A□
Self Drive Type (3-Terminals type)	RN, RL, RM, RP, B□

Diameter (mm)	
A	40.1 min.
B	30.1 to 40
C	20.1 to 30
D	10.1 to 20

Standard Products
2-terminals, External-Drive Type

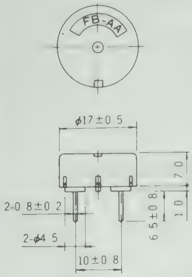
Part.No	Sound Pressure Level (Measuring conditions)	Capacitance (at 120Hz)	Maximum Input Voltage
EFB-AA40D101	70dBmin. (10Vp-p,4kHz Square wave,10cm)	7,000pF±30%	25Vp-p
EFB-RD22C41	85dBmin. (15Vp-p,4kHz Square wave,10cm)	15,000pF±30%	30Vp-p
EFB-R49C02Y	70dBmin. (5Vp-p,4kHz Square wave,10cm)	12,000pF±30%	
EFB-RC24C41	70dBmin. (5Vp-p,4kHz Square wave,10cm)	12,000pF±30%	
EFB-RD24C41	80dBmin. (15Vp-p,4kHz Square wave,10cm)	12,000pF±30%	
EFB-RD24C01B	85dBmin. (15Vp-p,4kHz Square wave,10cm)	15,000pF±30%	
EFB-RW20C01	75dBmin. (15Vp-p,610Hz Square wave,10cm)	20,000pF±30%	
EFB-RS45D01	65dBmin. (5Vp-p,4kHz Square wave,10cm)	15,000pF±30%	25Vp-p
EFB-RQ38C01	85dBmin. (10Vrms,2.5kHz Sine wave,10cm)	24,000pF±30%	30Vp-p
EFB-RU25C01	85dBmin. (10Vp-p,2.5kHz Square wave,10cm)	24,000pF±30%	
EFB-AB20C001	85dBmin. (10Vp-p,2.5kHz Square wave,10cm)	21,000pF±30%	
EFB-AF24C101	85dBmin. (10Vp-p,2.5kHz Square wave,10cm)	24,000pF±30%	
EFB-AH20C001	70dBmin. (3Vp-p,2kHz Square wave,10cm)	21,000pF±30%	25Vp-p
EFB-AL30D001	66dBmin. (15Vp-p,3kHz Square wave,10cm)	60,000pF±30%	30Vp-p
EFB-RR08B03	80dBmin. (10Vrms,800Hz Sine wave,10cm)	60,000pF±30%	30Vp-p (For telephone ringer)
EFB-RR10B01	85dBmin. (10Vrms,1kHz Sine wave,10cm)	90,000pF±30%	
EFB-AD12B101	80dBmin. (10Vp-p,1kHz Square wave,10cm)	40,000pF±30%	
EFB-AE08A101	85dBmin. (10Vp-p,1kHz Square wave,10cm)	65,000pF±30%	

- Operating temperature range: −10 to 60℃
- Storage temperature range: −20 to 70℃

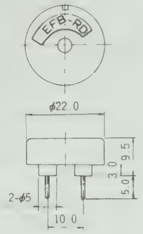
Dimensions
2-terminals, External-Drive Type

(Unit: mm)

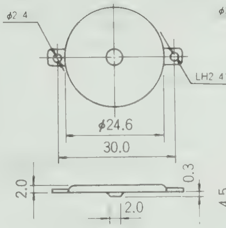
EFB-AA40D101



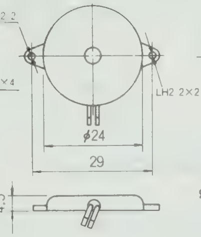
EFB-RD22C41



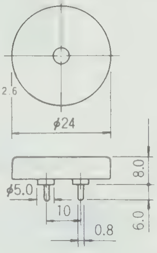
EFB-R49C02Y



EFB-RC24C41



EFB-RD24C411



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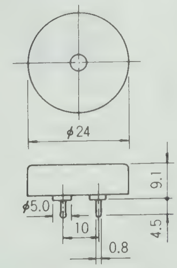

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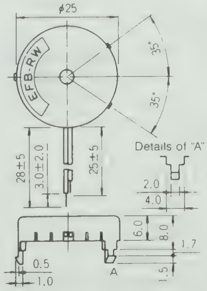

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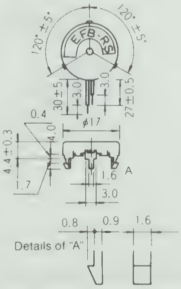

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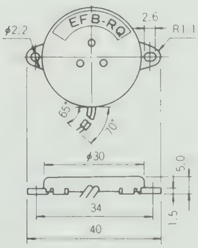

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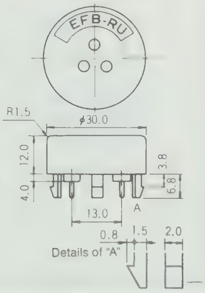
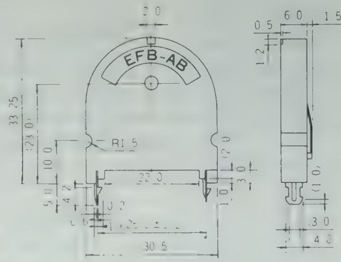


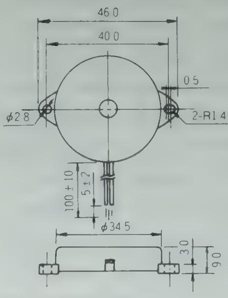
■Dimensions

2-Terminals, External-Drive Type

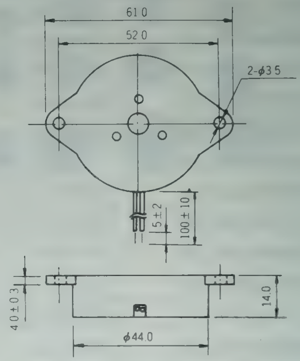
EFB-AB20C001



EFB-AD12B101



EFB-AE08A101



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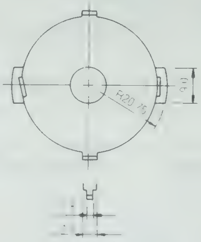

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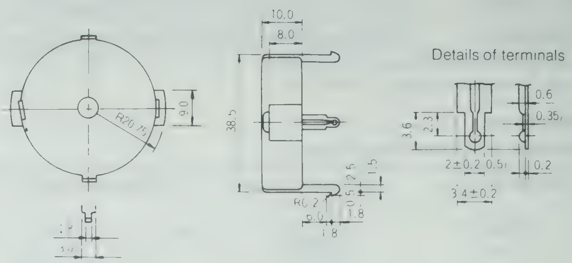
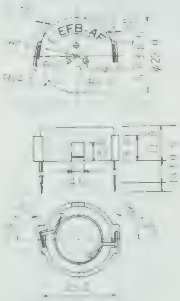
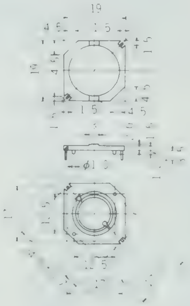


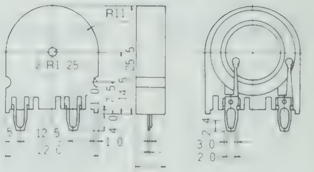
EFB-AF24C101



EFB-AL30D001



EFB-AH20C001



(Unit : mm)

■Standard Products

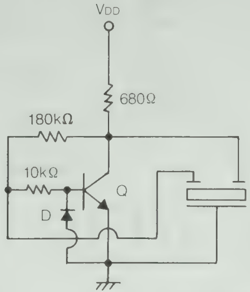
3-Terminals, Self Drive Type

Part No.	Sound Pressure Level (Measuring conditions)	Oscillating Frequency	Standard Driving Circuit
EFB-RM38C13	96 dB min. (10 VDC, 10 cm)	3.5±0.6 kHz	Driving Circuit (1)
EFB-RM38C15	96 dB min. (10 VDC, 10 cm)	3.5±0.6 kHz	
EFB-RL20C101	90 dB min. (12 VDC, 10 cm)	2.0±0.35 kHz	
EFB-RL23C12	96 dB min. (12 VDC, 10 cm)	2.3±0.35 kHz	
EFB-RL28C11	104 dB min. (12 VDC, 10 cm)	2.8±0.4 kHz	
EFB-RL37C02	86 dB min. (12 VDC, 10 cm)	3.7±0.5 kHz	
EFB-RL37C05	96 dB min. (12 VDC, 10 cm)	3.7±0.5 kHz	
EFB-RL37C20	106 dB min. (12 VDC, 10 cm)	3.7±0.5 kHz	
EFB-RP34B21	85 dB min. (9 VDC, 1 m)	3.4±0.4 kHz	Driving Circuit (2)
EFB-RN65C01	85 dB min. (12 VDC, 10 cm)	6.5±0.7 kHz	Driving Circuit (1)
EFB-BC20C101	80 dB min. (12 VDC, 10 cm)	2.0±0.4 kHz	
EFB-BC23C101	80 dB min. (12 VDC, 10 cm)	2.3±0.5 kHz	

- Operating temperature range: −10 to 60°C
- Storage temperature range: −20 to 70°C

Standard Driving Circuits (For Self Drive Type)

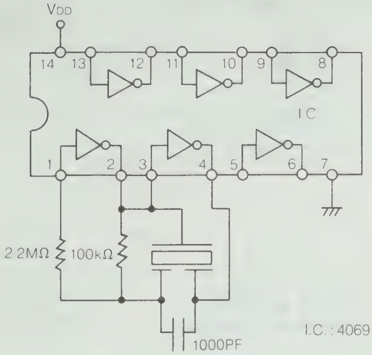
[Driving Circuit(1)]



Q:2SC1685 or equivalent
D:MA150 or equivalent

[Continuos Sound]

[Driving Circuit(2)]



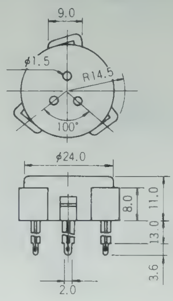
I.C.: 4069

[Continuous Sound]

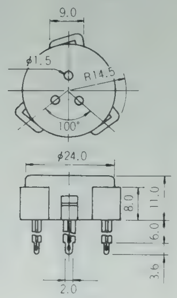
■Dimensions

3-Terminals, Self-Drive Type

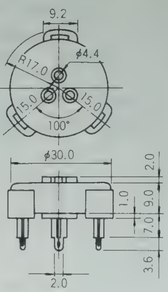
EFB-RM38C13



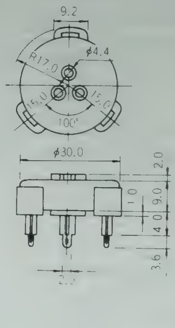
EFB-RM38C15



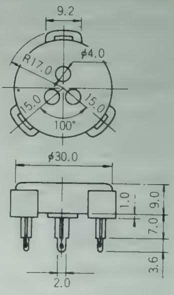
EFB-RL20C11
EFB-RL23C12
EFB-RL28C11
EFB-RL37C02



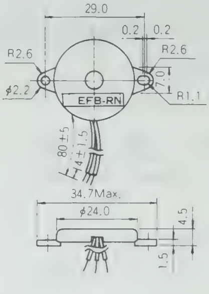
EFB-RL37C05



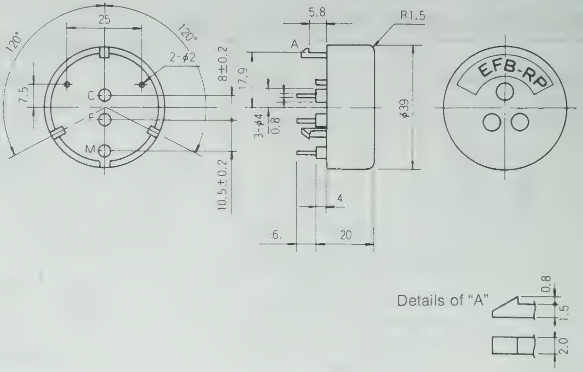
EFB-RL37C20



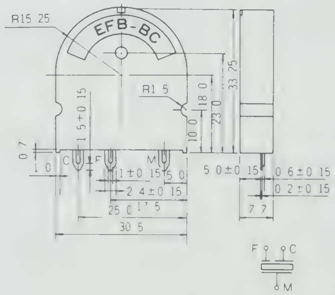
EFB-RN65C01



EFB-RP34B21



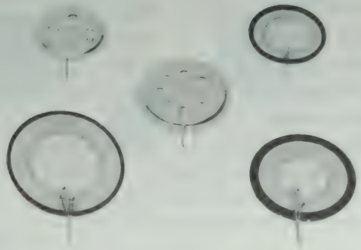
EFB-BC20C101
EFB-BC23C101



Piezoelectric Speaker

Type EFB-V☐

Frequency range of conventional piezoelectric ceramic buzzer was more than 2 kHz because of its resonant frequency. Accordingly it has been mainly applied to single tone generator for verifying signal and warning signal.
Piezoelectric speaker newly developed by us, however, generates sound in broad frequency range such as not only tone ringer of telephone but also melody tone and human voice.



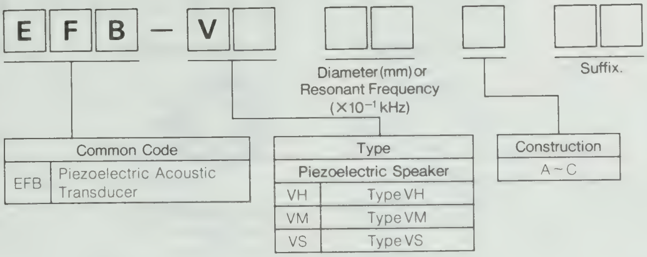
Features

- Wide frequency response (Ex.VH66B: 200Hz ~20kHz)
- Supper light in weight (Ex.VH36: 3.5g)
- Ultra thin in thickness (Ex.VS19: 1.0mm)
- No gereration of magnetic field
- Low power consumption

Applications

- Speaker for portable TV and cassette recorder etc.
- Receiver and ringer for telephone
- Speaker for melody tone and human voice
- Alarm clocks, electronic toys etc.
- Interphones, chimes

■ Part Number Code



Common Code	
EFB	Piezoelectric Acoustic Transducer

Type	
Piezoelectric Speaker	
VH	Type VH
VM	Type VM
VS	Type VS

Construction
A ~ C

Standard Products

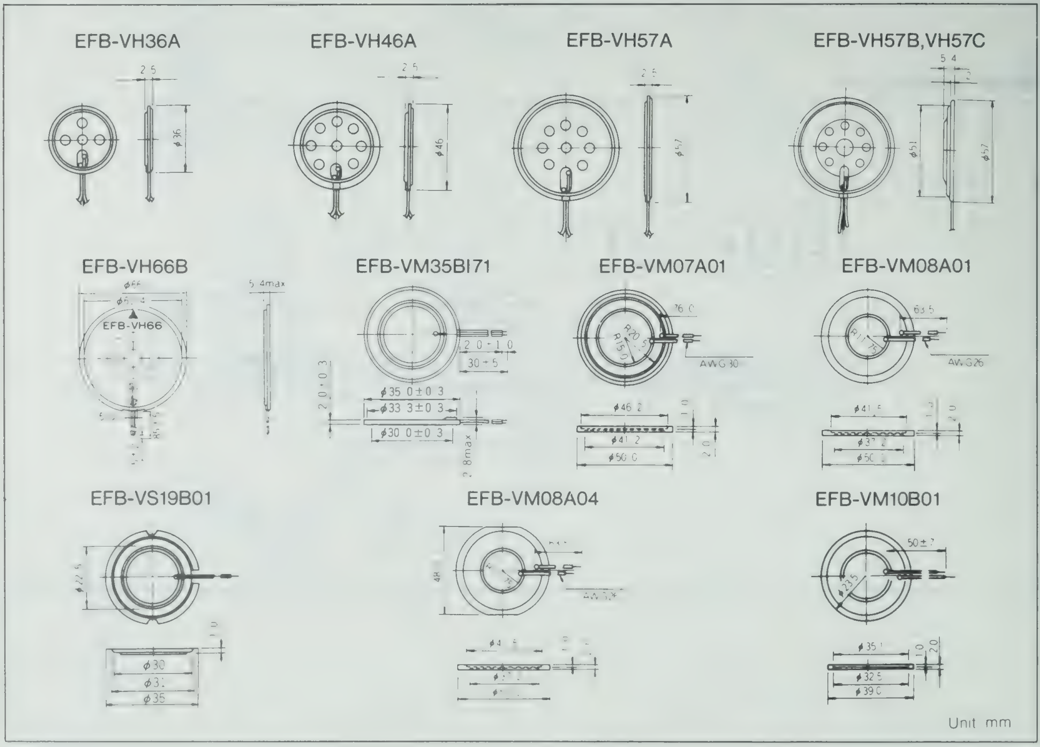
Part No.	Covering Frequency Range	Maximum Input Voltage	Capacitance (at 120Hz)	weight
EFB-VH36A	600Hz～20kHz	10Vrms	110nF±30%	3.5g
EFB-VH46A	400Hz～20kHz		180nF±30%	5.5g
EFB-VH57A	300Hz～20kHz		180nF±30%	9g
EFB-VH57B	300Hz～20kHz	7Vrms	450nF±30%	18g
EFB-VH57C	300Hz～20kHz		450nF±30%	18g
EFB-VH66B	200Hz～20kHz		450nF±30%	32g
EFB-VM35B171	300Hz～20kHz		290nF±30%	1.8g

- ● Operating temperature range: −10 to 60°C
- ● Storage temperature range: −20 to 70°C

Part No.	Resonant Frequency	Resonant Resistance	Maximum Input Voltage	Capacitance (at 120Hz)
EFB-VM07A01	700±120Hz	250Ωmax.	10Vrms	180nF±30%
EFB-VM08A01	800±150Hz	950Ωmax.		74nF±30%
EFB-VM08A04				74nF±30%
EFB-VM10B01	1000±200Hz	500Ωmax.		125nF±30%
EFB-VS19B01	1900±200Hz	200Ωmax.		70nF±30%

- ● Operating temperature range: −10 to 60°C
- ● Storage temperature range: −20 to 70°C

Dimensions



Piezoelectric Buzzer with Driving Oscillator Circuitry

Type EFB-C☐

The piezoeiectric buzzer consisting of piezo-electric buzzer element and drive oscillator circuitry, will operate directly from commonly used voltage source such as dry batteries.

Features

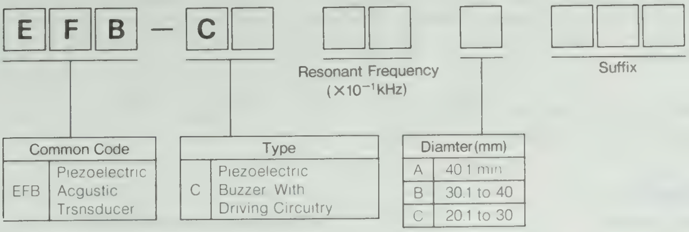
- High sound pressure level at low supply voltage (EX. Type CA:S.P.L.≧95dB/10cm, at 12VD/C)
- Low power consumption: 18mA max. at 12VDC
- Wide operating range of supply voltage: 3 to 20VDC.

Applications

Calling signal use and warning signal use.

- Office automation equipments
- Electric equipments for home appliames
- Alarm clocks, electronic toys, burgler alarm etc.

■Part Number Code



Common Code	
EFB	Piezoelectric Acgustic Trsnsducer

Type	
C	Piezoelectric Buzzer With Driving Circuitry

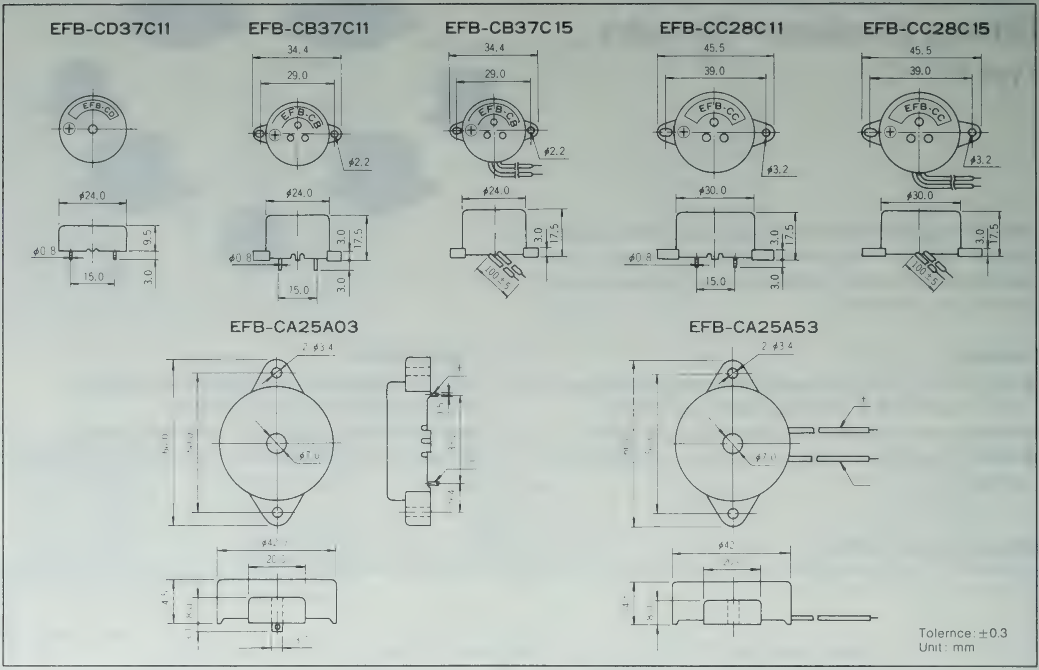
Diamter (mm)	
A	40.1 min
B	30.1 to 40
C	20.1 to 30

■Standard Products

Part No.	Sound Pressure Level (Measuring Conditions)	Oscillating Frequency	DC Current	Operating Range of Supply Voltage
EFB-CD37C11	80dB min. (12VDC,10cm)	3.7±0.5kHz	15mA max. (12VDC)	3 to 20VDC
EFB-CB37C11				
EFB-CB37C15				
EFB-CC28C11	90dB min. (12VDC,10cm)	2.8±0.5kHz		
EFB-CC28C15				
EFB-CA25A03	95dB min. (12VDC,10cm)	2.5±0.5kHz	18mA max. (12VDC)	
EFB-CA25A53				

- Operating temperature: −20 to 65°C
- Storage temperature: −30 to 80°C

■ Dimensions



Tolernce: ±0.3
Unit: mm

Prohibition for handling

1. DC voltage

   Be careful in designing of driving circuit not to apply DC voltage to the piezoelectric acoustic transducer.

Suggestions for handling

1. Wave form of input singal

   The piezoelectric acoustic transducer should be driven by a square wave or pulsed wave signal to obtain as large sound pressure level as possible. With the sinusoidal wave signal, the sound pressure level would decrase somewhat in a frequency range away from the resonant frequency.

2. Higher harmonic frequency

   With a pulsed wave or a square wave, the piezoelectric acoustic transducer may produce a higher harmonic level, In order to recuce the higher harmonic level, it is applied to connect a capacitor in parallel with the transducer.

3. Surge voltage generated by mechanical impact.

   When a mechanical impact occurs(such as that which may occur if it is dropped to the floor), the piezoelectric acoustic transducer may be caused to operated, generating a surge voltage (in a range from a few milivolts upto a few ten volts.) When using the buzzer element, care should be taken not to expose the element to excessive shock as well as to protect the peripheral circuit.

4. Protection from obstacles

   The buzzer should be free from water or dust or obstables covering the resonance hole so as not to cause lowering of the sound pressure level.

5. Limit of usage

   The piezoelectric acoustic transducers shall be used in the air. Any application of the transducers in the water shall be prohibitted.

6. Piezoelectric speakers:

   The piezoelectric speakers are fundamentally differ from conventinal magnitic speakers in the principles such as the vibration modes and constructions etc.So in the applications of the piezoelectric speakers, mounting method, matching impeadance and driving circuits etc., should be considered technichally.(if you find some difficuities, please contact us.)

7. Piezoelectric receivers:

   The piezoelectric receiver for telephone can not replace conventional magnetic receiver without circuit modifications.

Piezoelectric Diaphragm/ Piezoelectric Ceramic Buzzer Element

Type EFB-S

A piezoelectric diaphragm ceramic buzzer element, a single disc-shaped transducer consisting of piezoelectric ceramic bonded to a metal plate, is available from 10 to 50mm in diameter and 0.2 to 0.6mm in thickness.

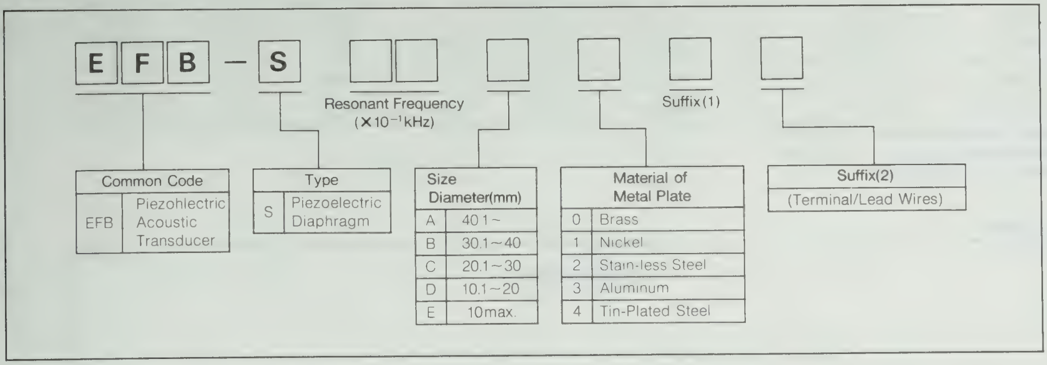
Features

- Thin thickness (0.2 to 0.6mm Buzzer element)
- Low power consumption
- Long life and no-noise due to non-contact
- Covering wide frequency range

Applications

- Home electric equipment, watch, toy
- OA equipment, calculator, camara
- Tweeter

■ Part Number Code



Common Code	
EFB	Piezohlectric Acoustic Transducer

Type	
S	Piezoelectric Diaphragm

Size Diameter(mm)	
A	40.1~
B	30.1~40
C	20.1~30
D	10.1~20
E	10max.

Material of Metal Plate	
0	Brass
1	Nickel
2	Stain-less Steel
3	Aluminum
4	Tin-Plated Steel

Suffix(2)
(Terminal/Lead Wires)

Standard Products

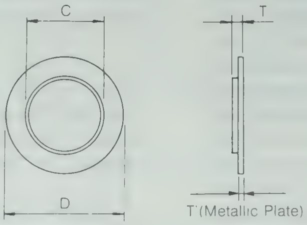
2-terminals, External Drive Type

Part No.	Resonant Frequency (kHz)	Resonant Resistance (Ω)max.	Capacitance (pF) ±30%	Dimensions(mm)			Metal Plate	
				D	C (±0.5)	T (±0.06)	材質 Material	Thickness (mm) (±0.05)
EFB-S10D21	10.5±2.0	200	15,000	12.5±0.1	9.6	0.23	Stainless steel	0.10
EFB-S10D42	12.0±1.2	350	8,000	15.0±0.1	10.8	0.38	Tin-plated iron	0.20
EFB-S77D41	7.6±1.0	320	12,000	20.0±0.1	15.0	0.43	Tin-plated iron	0.20
EFB-S66D01	6.6±1.0	320	12,000	20.0±0.1	15.0	0.43	Brass	0.20
EFB-S64C21P	6.4±1.0	400	12,000	21.0±0.1	15.0	0.38	Stainless steel	0.15
EFB-S62C03P	6.2±1.0	300	12,000	21.0±0.1	15.0	0.43	Brass	0.20
EFB-S57C21	5.7±1.0	320	12,000	21.0±0.1	15.0	0.33	Stainless steel	0.10
EFB-S49C02P	5.2±1.0	380	12,000	22.5±0.1	15.0	0.43	Brass	0.20
EFB-S46C04P	4.6±1.0	300	18,000	27.0±0.15	20.3	0.53	Brass	0.25
EFB-S46C07P	4.6±1.0	300	18,000	27.0±0.1	20.3	0.53	Brass	0.25
EFB-S46C24P	4.6±1.0	200	18,000	27.0±0.1	20.3	0.43	Stainless steel	0.15
EFB-S46C42	4.6±1.0	300	18,000	27.0±0.1	20.3	0.48	Tin-plated iron	0.20
EFB-S30C01V	6.6±1.0	2,500	12,000	27.0±0.1	15	0.43	Brass	0.20
EFB-S30C42V	3.0±1.0	2,500	12,000	27.0±0.1	15	0.43	Tin-plated iron	0.20
EFB-S29B02	2.9±1.0	250	26,000	34.7±0.2	25	0.53	Brass	0.25
EFB-S27B01	2.7±0.7	250	32,000	34.7±0.2	25	0.45	Brass	0.20
EFB-S27B21	2.7±0.7	250	32,000	34.7±0.2	25	0.40	Stainless steel	0.15
EFB-S16B01	1.6±0.5	1,000	40,000	34.7±0.2	25	0.28	Brass	0.10
EFB-S15A01	1.5±0.5	2,000	35,000	50±0.2	30	0.51	Brass	0.20
EFB-S11A05	1.1±0.5	3,000	35,000	50±0.2	30	0.46	Brass	0.15
EFB-S07A03	0.7±0.4	1,500	65,000	50±0.2	30	0.33	Brass	0.15

- ● Operating temperature range: −10 to 60°C
- ● Storage temperature range: −20 to 70°C
- ● Maximum input voltage: 30V

Dimensions

External-Drive Type



2-Terminals Type

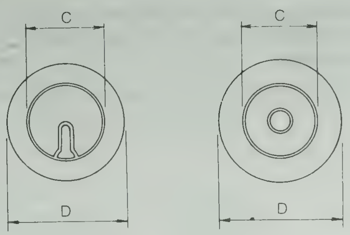
■定格 Standard Products
3-terminals, Self Drive Type

Part No.	Resonant Frequency (kHz)	Resonant Resistance (Ω)max.	Capacitance (pF) ±30%	Dimensions(mm)			Metal Plate	
				D	C (±0.5)	T (±0.06)	Material	Thickness (mm) (±0.05)
EFB-S59C01F	5.9±1.0	350	10,000	21±0.1	15	0.43	Brass	0.20
EFB-S46C04F	4.6±1.0	250	16,000	27±0.1	20.3	0.53	Brass	0.25
EFB-S37C03F	3.7±1.0	380	20,000	27±0.1	20.3	0.38	Brass	0.15
EFB-S33B21F	3.3±1.0	300	24,000	34.7±0.2	25	0.48	Stainless steel	0.20
EFB-S32B22F	3.2±1.0	220	25,000	34.7±0.2	25	0.55	Stainless steel	0.25
EFB-S31B01F	3.1±1.0	250	26,000	34.7±0.2	25	0.58	Brass	0.30
EFB-S29B22F	2.9±1.0	220	25,000	34.7±0.2	25	0.43	Stainless steel	0.15
EFB-S29B01F	2.9±1.0	250	24,000	34.7±0.2	25	0.53	Brass	0.25
EFB-S29B02F	2.9±1.0	220	25,000	34.7±0.2	25	0.55	Brass	0.25
EFB-S20A02F	2.0±0.5	550	23,000	41.3±0.2	25	0.58	Brass	0.30
EFB-S20A03F	2.0±0.5	700	25,000	41.3±0.2	25	0.53	Brass	0.25

- Operating temperature range: −10 to 60°C
- Storage temperature range: −20 to 70°C
- Maximum input voltage: 30V

■ Dimensions

Self-Drive Type



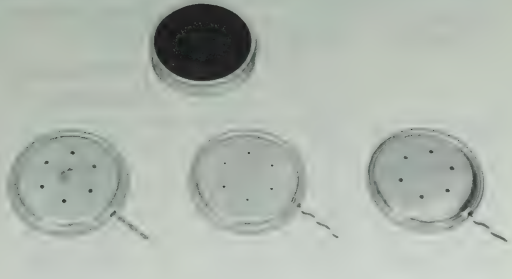
3-Terminals Type
with feedback tab

Specifications (Piezoelectric Diaphragm)

<table>
<tr><th>Item</th><th>Test Method</th><th>Requirement</th></tr>
<tr><td>Temperature Characteristics</td><td>The resonant frequency and capacitance shall be measured at -20°C and 70°C.
(The reference temperature:20°C)</td><td>Max.resonant frequency change: ±15%
Max.capacitance change: ±0.8%/°C</td></tr>
<tr><td>Damp Heat (Steady State)</td><td>Specimen shall be subjected to in an ambient of 40±2°C and 90 to 95%RH for 250 hours and allowed to cool at room temperature for 24 hours before the specified measure ments.</td><td>Max.resonant frequency change: ±10%
Max.capacitance change: ±15%</td></tr>
<tr><td>Dry Heat</td><td>Specimen shall be subjected to in an ambient of 70±3°C for 250 hours and allowed to cool at room temperature for 24 hours before the Specified measurements.</td><td rowspan="2">Max.resonant frequency change: ±10%
Max.capacitance change: ±10%</td></tr>
<tr><td>Cold</td><td>Specimen shall be subjected to in an ambient of -20±3°C for 250 hours and stabilized at room temperature for 24 hours before the specified measurements.</td></tr>
<tr><td>Temperature Cycle</td><td>The specified temperature cycles following shall be repeated twenty times.
<table>
<tr><th>Step</th><th>Temperature</th><th>Peried(minutes)</th></tr>
<tr><td>1</td><td>-20±3</td><td>60</td></tr>
<tr><td>2</td><td>Room Temp</td><td>5</td></tr>
<tr><td>3</td><td>70±3</td><td>60</td></tr>
<tr><td>4</td><td>Room Temp</td><td>5</td></tr>
</table></td><td rowspan="2">Max.resonant frequency change: ±15%
Max.capacitance change: ±0.8%/°C</td></tr>
<tr><td>Continious Operation</td><td>Specimen shall be subjected to in an ambient temperature of 25±3°C and 60%RH max. for 250 hours with a load of 3Vp-p, and 2048Hz.</td></tr>
</table>

Piezoelectric Receiver

Type EFV-RT



The Piezoeiectric receiver (earphone). which houses ultra thin piezoelectric element in a metal or plastic case, has a special acoustic cavity and is suitable for telephone receiver.

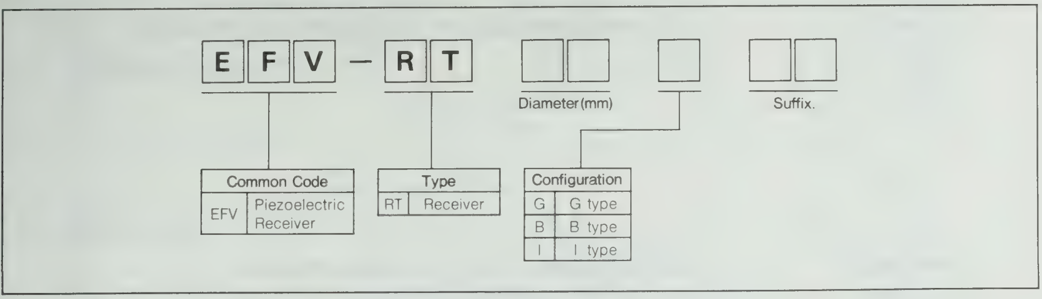
Features

- Low power consumption
- Super light and ultra thin thickness
- High sound pressure level
- Provides clear sound for application of telephone (Type RT32G)

Application

- Receiver for telephone
- Interphone, chime

Part Number Code



Common Code	
EFV	Piezoelectric Receiver

Type	
RT	Receiver

Configuration	
G	G type
B	B type
I	I type

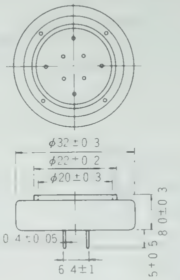
■Standard Products

Part No.	Frequency Range	Sound Pressure Level (1.0Vrms ax 1kHz Coupler:6cc)	Impeadance (at 1kHz)	Capacitance (at 120Hz)	Maximum Input Voltage
EFV-RT32G03	0.3~3.4kHz	104dB±4dB	1.8kΩ±30%	75nF±30%	5Vrms
EFV-RT33I004		105dB±4dB	1.5kΩ±30%	105nF±30%	
EFV-RT33I012		107dB±3dB	2.8kΩ±30%	60nF±30%	
EFV-RT33I021		107dB±3dB	2.8kΩ±30%	60nF±30%	
EFV-RT33I051		105dB±3dB	1.5kΩ±30%	105nF±30%	
EFV-RT33I131		105dB±3dB	2.8kΩ±30%	60nF±30%	

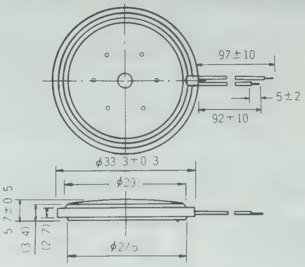
- Operating Temperature Range: −10 to 60°C.
- Storage Temperature Range: −20 to 60°C.

■Dimensions

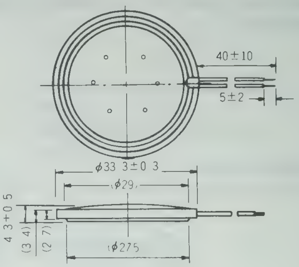
EFV-RT32G03



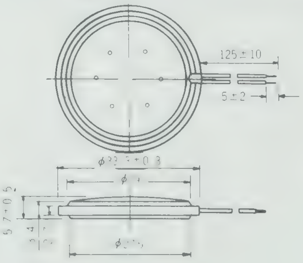
EFV-RT33I004



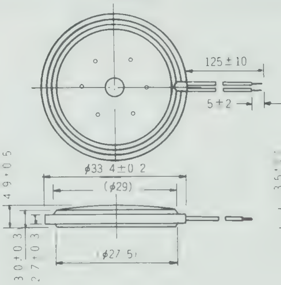
EFV-RT33I012



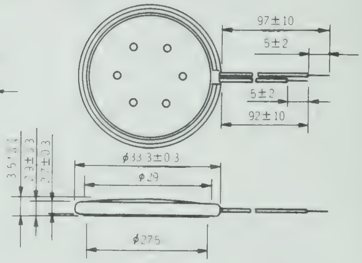
EFV-RT33I021



EFV-RT33I051



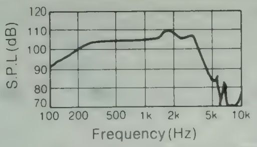
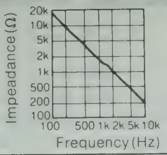
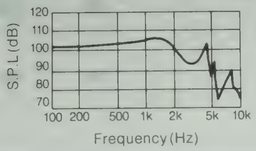
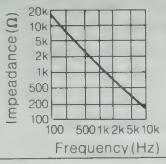
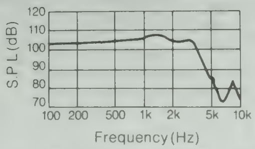
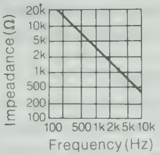
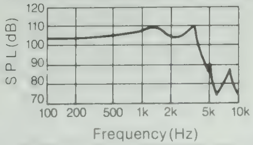
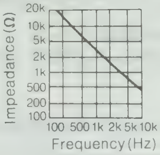
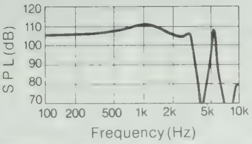
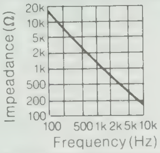
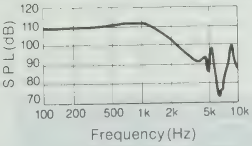
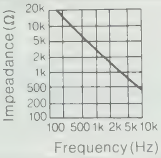
EFV-RT33I131



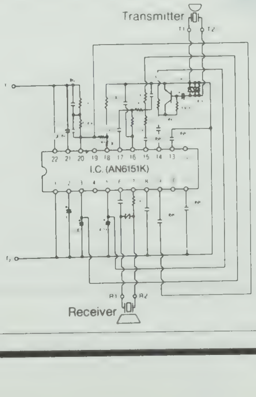
Unit: mm

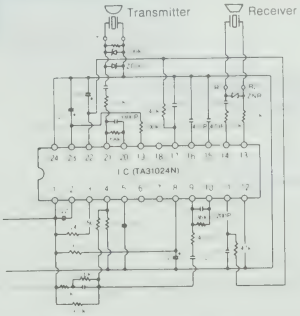
Piezoelectric Acoustic Transducers

Typical Characteristics

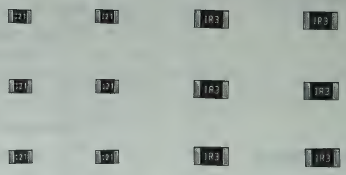
Part No.	Frequency vs. Sound Pressure Level (Coupler: 6cc)	Frequency vs. Impeadance
EFV-RT32GO3		
EFV-RT33I004		
EFV-RT33I012		
EFV-RT33I021		
EFV-RT33I051		
EFV-RT33I131		

Application Circuits





Thick Film Chip Resistors
Type ERJ: 1/10W, 1/8W,

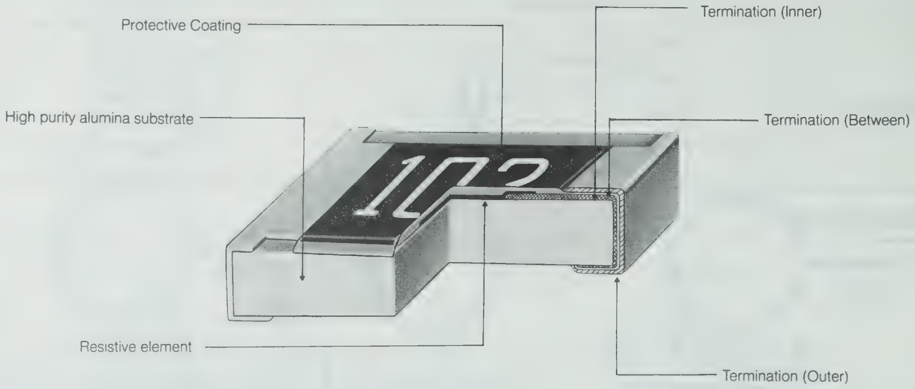


Matsushita Elèctric thick film chip resistors, very small, thin and high reliable, have qualified metal glaze element on high purity alumina substrates coated by special glass. It enables to make sets compact and light weight.
The unique construction of termination prevents inner electrode from silver migration by special coating.

Oustanding Features

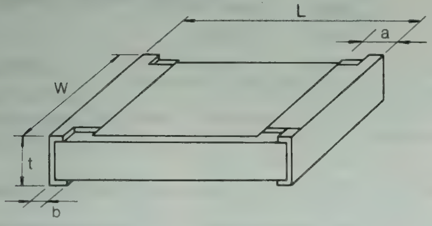
- **Uniform Quality Reliable**
  Fully automated process and severe quality-control system result uniform quality and consistent performance reliability.
- **Unique Termination**
  No silver migration by unique construction of termination.
- **Excellent High Frequency Characteristics**
  Excellent high frequency characteristics compared with leaded resistors.
- **Equivalent Specification**
  EIAJ-RC-2690, EIAJ-RC-1009B, EIA-RS-481A

Construction and Materials



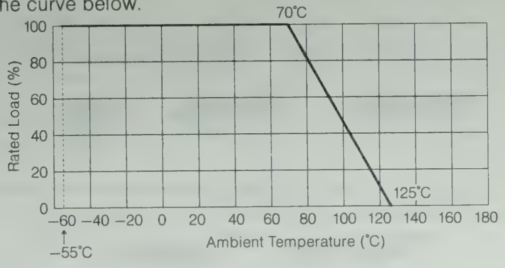
ERJ-860801

General Specifications



Power Derating Curve

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



Type No.	Power Rating (W) at 70°C	Max. RCWV (Note 1)	Max. Over-load Voltage	Dielectric with-standing Voltage	Res. Tol. (%)	Resistance Range(Ω)		Std. Res. Values	Dimensions: mm (inch)					Net Weight per 1,000 pcs.
						Min.	Max.		L	W	t	a	b	
ERJ-6	1/10	150V	200V	200V	1	10	1M	E-96	2.0 ±0.15 (.079 ±.008)	1.25 ±0.10 (.049 ±.004)	0.60 ±0.10 (.022 ±.004)	0.40 ±0.25 (.016 ±.010)	0.40 ±0.25 (.016 ±.010)	4 g (.0088 lbs.)
					5	1	5.6M	E-24						
ERJ-6GEO	Rated current: 2A (Resistance value is lower than 50mΩ)													
ERJ-8	1/8 (1/4)	200V	400V	500V	1	10	1M	E-96	3.20 +0.05 −0.20 (.126 +.002 −.008)	1.60 +0.05 −0.15 (.063 +.002 −.006)	0.60 ±0.10 (.022 ±.004)	0.50 ±0.25 (.020 ±.010)	0.50 ±0.25 (.020 ±.010)	10 g (.022 lbs.)
					5	1	5.6M	E-24						
ERJ-8GEO	Rated current: 2A (Resistance value is lower than 50mΩ)													

Note 1. Rated continuous working voltage (RCWV) shall be determined from
$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$, or Max. RCWV listed above, whichever less.

Explanation of Part Number

1	2	3		4	5	6	7	8	9	10	11	12
E	R	J	–	8	G	E	Y	J	1	0	2	S

Common Code
Chip Resistors

Size, Rated power, Tolerance & TCR	
6GEYJ	0805 size 1/10W +−5%
6ENF	0805 size 1/10W +−1% 100ppm
6GEYO	0805 size chip jumper, 50m ohm max.
8GEYJ	1206 size 1/8W +−5%
8ENF	1206 size 1/8W +−1% +−100ppm
8GEYO	1206 size chip jumper, 50m ohm max.

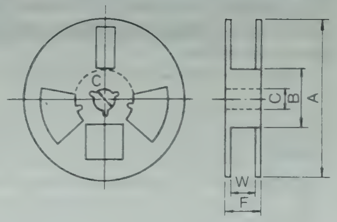
Packaging	
S	Tape & Reel Paper punched tape Plastic Reel

Norminal resistance value code

The first two(three) digits are significant figures of resistance and the third(fourth) one denotes number of zeros following.
"R" Indicates decimal point.
15ohm is indicated as "150"(5%)and "15RO"(1%).
Jumper is coded as "ROO".

Taping Specifications

Reel



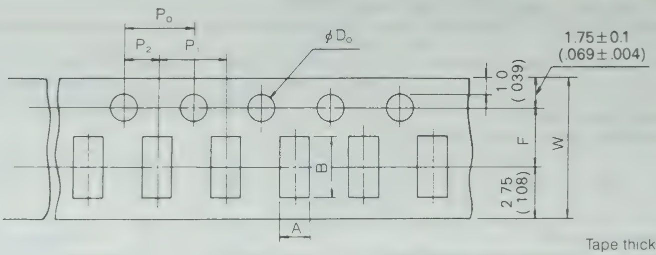
Standard Quantity per Reel

Type	Paper Tape
6G	5,000
8G	5,000

Dimensions	A	B	C	F	W
mm	178±2	80±1	13±0.5	12±1.5	10±1.0
inch	7.008±0.079	3.150±0.039	0.512±0.020	0.472±0.059	0.394±0.039

Paper Carrier Tape

mm(inch)

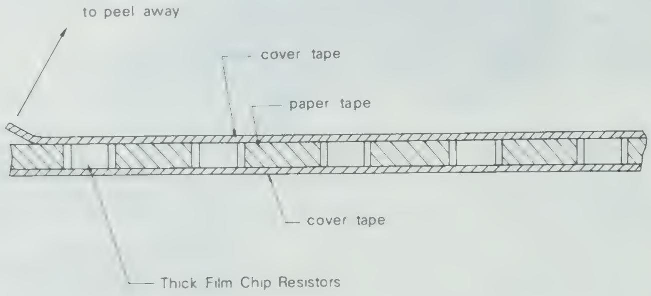


Tape thickness 0.84±0.05(0.033±.002)

Dimensions	ϕD_0	F	P_0	P_1	P_2	W
mm	$1.5^{+0.1}_{-0}$	3.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05	8.0±0.2
inch	$0.059^{+0.004}_{-0}$	0.138±0.002	0.157±0.004	0.157±0.004	0.079±0.002	0.315±0.008

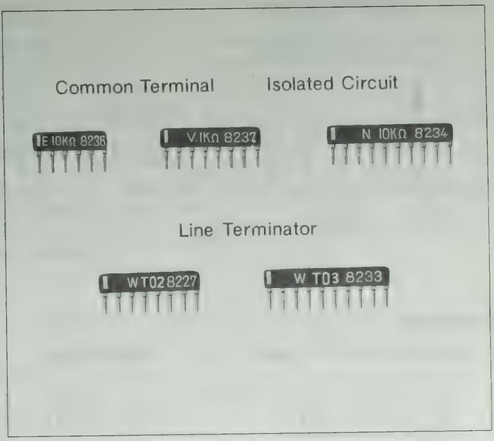
Note:

1. Dimensions A and B of the chip pocket and the thickness of tapes shall be defined separately.
   (reference)
   6G type: A=1.60±0.15 mm (0.063±.006), B=2.5±0.2 mm (0.098±.008)
   8G type: A=2.0±0.15 mm (0.079±.006), B=3.6±0.2 mm (0.141±.008)
2. Cumulative pitch tolerance for feeding holes and chip pockets shall not exceed 0.2 mm (0.008 inch) over 10 pitches.
3. Sectional configuration and tape materials are not defined for the time being (reference). Section of carrier tape.



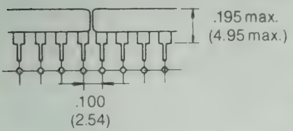
4. Carrier tape shall be flexible enough to be wound at minimum radius of 40 mm. (1.57 inch)
5. Approximately 250 mm (9.84 inch) leader shall be provided at each end of the tape.

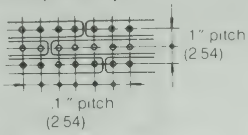
Resistor Networks, Low Profile
Type EXB-F



Features

● Low Profile	.195″(4.95 mm) max. seated height
● Highly stable thick film	Equivalent to MIL-R-83401
● Low T.C.R.	±200 ppm/°C (Standard) T.C. Tracking 50 ppm/°C typical
● Tough construction	Centralized clipping terminals on a thick alumina substrate
● Compact package	A short body length which can be inserted onto PC Board with .1″ pitch sequentially





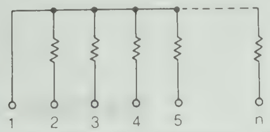
- ● Automatic SIP insertion capability
  Available for automatic insertion machine, contained either in stick magazines or in taped and boxed

Standard Circuits

n: Number of pins, 14 pins in max

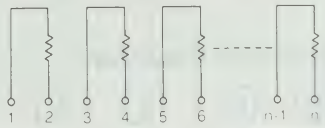
Common Terminal Type
EXB-F n E

3 to 13 resistors:(n-1) resistors



Isolated Type
EXB-F n V

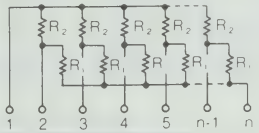
2 to 7 resistors: n/2 resistors



Custom Circuits

Line Terminator
EXB-F n W

Typical pairs
6 pin — 8 resistors
8 pin — 12 resistors
10 pin — 16 resistors

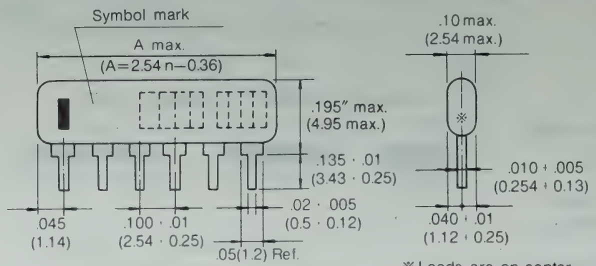


Code	R_1/R_2
T01	160/240
T02	180/390
T03	220/270
T04	220/330
T05	330/390
T06	330/470
T07	330/680
T08	1.5k/3.3k
T09	3k/6.2k

EXB-F, 860801

Dimensional Configurations

Dimension: inch (mm)
Dimensional Tol.: ±.005(0.13)

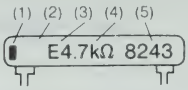


※ Leads are on center

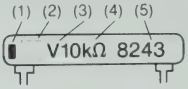
Part No.	Pins	Dimension A max. inch (mm)
EXB-F4	4	.386 (9.80)
EXB-F5	5	.586 (12.34)
EXB-F6	6	.586 (14.88)
EXB-F7	7	.686 (17.42)
EXB-F8	8	.786 (19.96)
EXB-F9	9	.886 (22.50)
EXB-F10	10	.986 (25.04)
EXB-F11	11	1.086 (27.58)
EXB-F12	12	1.186 (30.12)
EXB-F13	13	1.286 (32.66)
EXB-F14	14	1.386 (35.20)

Marking

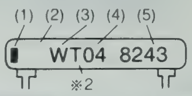
Common terminal type



Isolated type



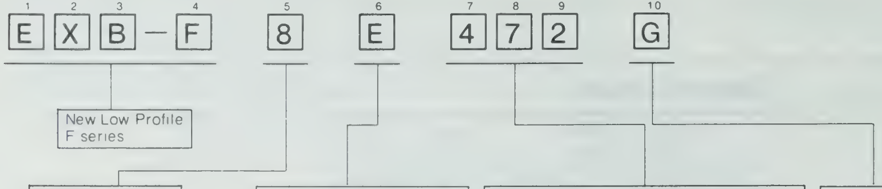
Line Terminator



Terminator Code No.	R₁/R₂
T01	160/240
T02	180/390
T03	220/270
T04	220/330
T05	330/390
T06	330/470
T07	330/680
T08	1.5k/3.3k
T09	3k/6.2k

(1) Bar identifying pin No. 1, making the defference below
(2) Symbol mark manufactured by Matsushita (over 7 pins)
(3) The type of circuits
(4) Resistance value with three digits, or terminafor code number (※2)
(5) EIA Date Code

Explanation of Part Numbers



Number of Pins	
Pins	Code
4 pins	4
5 pins	5
6 pins	6
7 pins	7
8 pins	8
9 pins	9
10 pins	10
11 pins	11
12 pins	12
13 pins	13
14 pins	14

Circuit configuration	
Type of Circuit	Code
Common terminal	E
Isolated	V
Line terminator	W

Resistance Value	
The first two digits are significant figures of resistance value and the third one denotes the number of zeroes following:	Example 330Ω : 331 4.7kΩ : 472 22kΩ : 223 100kΩ: 104

Resistance Tolerance	
Code	Tol.
G	±2%

Line Terminator Code No.					
Code	R_1/R_2	Code	R_1/R_2	Code	R_1/R_2
T01	160/240	T04	220/330	T07	330/680
T02	180/390	T05	330/390	T08	1.5k/3.3k
T03	220/270	T06	330/470	T09	3k/6.2k

Trimmer Potentiometers Cermet Series

Cermet Cross Reference

- Panasonic Cermet Trimmer Potentiometer Line-up

Panasonic Part number	Resistance Tolerance	C.R.V. Wattage Rating	Cross Reference		
			Bourns	Beckman	Spector
EVM-MAG	±20%	3% max. 0.5w (70°C)	3323P		
EVM-MBG	±20%	3% max. 0.5w (70°C)	3323S		
EVM-MSG	±20%	3% max. 0.5w (70°C)			
EVM-SOG	±20%	3% max. 0.5w (70°C)	3329H	62P/82P/61P	62-1-X/65Y
EVM-QOG	±20%	3% max. 0.5w (70°C)	3329P	62M/61M	62-3-X/65P
EVM-Q1G	±20%	3% max. 0.5w (70°C)	3329S	61PA/62PA/82PA	62-2-X165X
EVM-C7G	±10%	1% max. 0.75w(70°C)			
EVM-CEG	±10%	1% max. 0.5w (70°C)	3299W/3296W	66W/68W	64W/52W
EVM-CFG	±10%	1% max. 0.5w (70°C)	3299/3296X	66X/68X	64X/52X
EVM-MOF	±10%	1% max. 0.5w (85°C)	3386P	72P	63P
EVM-M1F	±10%	1% max. 0.5w (85°C)	3386H	72RX	
EVM-31G	±25%	1% max. 0.3w (70°C)	3306W		
EVN-36C	±25%	1% max. 0.3w (70°C)	3306W		

Carbon Series

Carbon Cross Reference

- Panasonic Carbon Trimmer Potentiometer Line-up

Panasonic Part Number	Resistance Tolerance	Wattage Rating	Cross Reference		
			Piher	CTS	Murata
EVN-K4A	+/−30%	0.1w(50°C)	PT10V	U-260/265	RVA-0911V-306
EVN-K0A	+/−30%	0.1w(50°C)	PT10H(2.5)	X-260/265	RVA-0911H-304

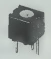
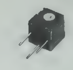
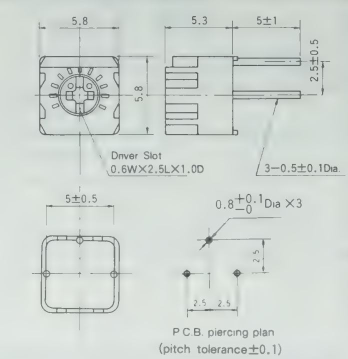
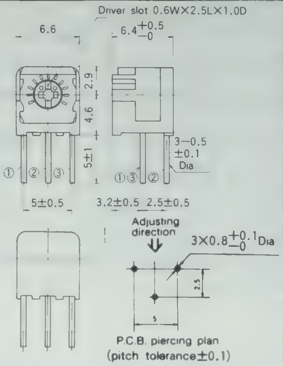
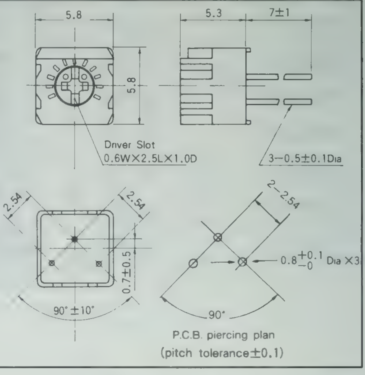
5MM Square Industrial Grade Sealed Type

EVM-MAGA01BXX. . . . .Lay Down Version, Top Adjust.
EVM-MBGA01BXX. . . . .Stand Up Version, Side Adjust.
EVM-MSGA01BXX. . . . .Lay Down Version, Top Adjust.

Note: To complete part number, please add resistance code (2 digits).

■ Dimensions

(unit : mm)

EVM-MAG	EVM-MBG	EVM-MSG
		
 5.8 5.3 5±1 2.5±0.5 5.8 Driver Slot 0.6W×2.5L×1.0D 3−0.5±0.1Dia. 5±0.5 0.8+0.1−0 Dia ×3 2.5 2.5 2.5 P.C.B. piercing plan (pitch tolerance±0.1)	 Driver slot 0.6W×2.5L×1.0D 6.6 6.4+0.5−0 2.9 4.6 5±1 3−0.5 ±0.1 Dia ① ② ③ ① ③ ② 5±0.5 3.2±0.5 2.5±0.5 Adjusting direction 3×0.8+0.1−0 Dia 2.5 5 P.C.B. piercing plan (pitch tolerance±0.1)	 5.8 5.3 7±1 5.8 Driver Slot 0.6W×2.5L×1.0D 3−0.5±0.1Dia 2.54 2.54 2−2.54 0.7±0.5 0.8+0.1−0 Dia ×3 90°±10° 90° P.C.B. piercing plan (pitch tolerance±0.1)

■ Specifications

Items	EVM-MAG/MBG/MSG
Resistance Range	100 to 2MΩ
Tolerance	STD ±20% or ±10% Avail.
Taper	Linear
Residual Resistance	1% or 2Ω (whichever is bigger)
Wattage Rating	0.5W max. at 70°C
Voltage Rating	200V max.
TCR	±100PPM/°C
CRV	3% or 3Ω (whichever is bigger)
Rotation Torque	100 gf·cm max.
Stopper Strength	300 gf·cm min.
Rotation Angle	230° nom.
Operating Temperature	−55°C to +120°C

6MM Dia. Industrial Grade Sealed Type

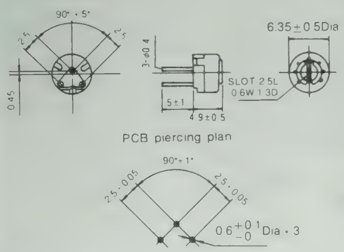
EVM-S0GA01BXX......Lay Down Version, Top Adjust.
EVM-Q0GA01BXX......Lay Down Version, Top Adjust.
EVM-Q1GA01BXX......Stand Up Version, Side Adjust.

Note: To complete part number, please add resistance code (2 digits).

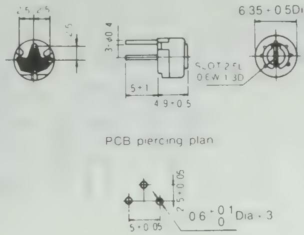
■ Dimensions

(unit: mm)

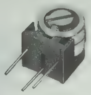
EVM-S0G

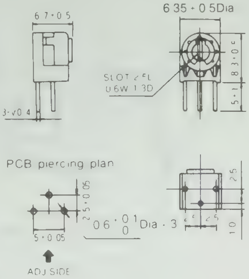


EVM-Q0G



EVM-Q1G



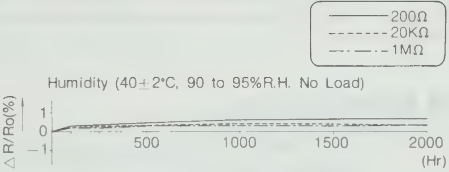


■ Specifications

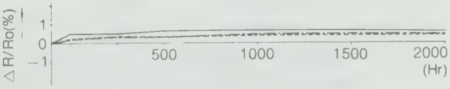
Items	EVM-S0G/Q0G/Q1G
Resistance Range	100 to 2MΩ
Tolerance	STD ±20% or ±10% Avail.
Taper	Linear
Residual Resistance	1% or 2Ω(whichever is bigger)
Wattage Rating	0.5W max. at 70℃
Voltage Rating	200V max.
TCR	±100PPM/℃
CRV	3% max.
Rotation Torque	20 to 200g·cm
Stopper Strength	500g·cm min.
Rotation Angle	270°±10°
Operating Temperature	−55℃ to +125℃

■ Environmental Data

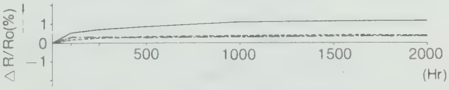
Humidity (40±2°C, 90 to 95%R.H. No Load)



High Temperature (85±2°C, No Load)



Load (70±2°C, Rated Load 1.5 Hrs ON 0.5 Hrs OFF)



4MM & 3/4″ Industrial Grade Sealed Type

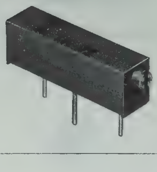
EVM-C7GA01BXX. . . . .3/4″ Multi Turn, Side Adjust.

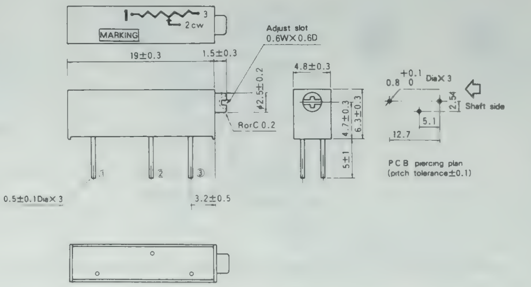
Note: To complete part number, please add resistance code (2 digits)

■ Dimensions

(unit: mm)

EVM-C7G





■ Specifications

Items	EVM-C7G
Resistance Range	100 to 1MΩ
Tolerance	±10%
Taper	Linear
Residual Resistance	1% or 2Ω (whichever is bigger)
Wattage Rating	0.75W max. at 70℃
Voltage Rating	300V max.
TCR	±100PPM/℃
CRV	1% or 1Ω (whichever is bigger)
Rotation Torque	360 gf·cm max.
Stopper Strength	Wiper Assembly Idles
Rotation Angle	15 ±3 turns
Operating Temperature	−55℃ to +125℃

3/8″ Industrial Grade Sealed Type

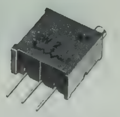
EVM-CEGA01BXX. . . . .Multi Turn, Top Adjust.
EVM-CFGA01BXX. . . . .Multi Turn, Side Adjust.

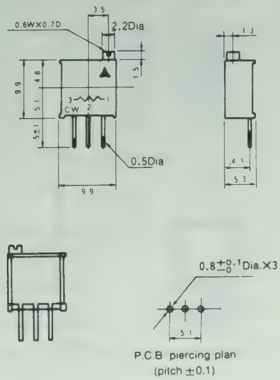
Note : To complete part number, please add resistance code (2 digits)

■ Dimensions

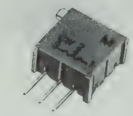
(unit : mm)

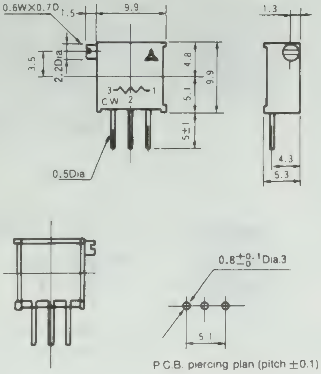
EVM-CEG





EVM-CFG





■ Specifications

Items	EVM-CEG/CFG
Resistance Range	100 to 1 MΩ
Tolerance	±10%
Taper	Linear
Residual Resistance	3% or 1Ω (whichever is bigger)
Wattage Rating	0.5W at 70℃ 1000 Hrs.
Voltage Rating	200V max.
TCR	±100 ppm/℃
CRV	1% or 1Ω (whichever is bigger)
Rotation Torque	360 gf·cm max.
Stopper Strength	Wipe assembly idles
Rotation Angle	20±3 turns
Operating Temperature	−55℃ to +125℃

3/8″ Industrial Grade Sealed Type

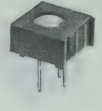
EVM-M0FA01BXX. . . . .Lay Down Version, Top Adjust, Single Turn.
EVM-M1FA01BXX. . . . .Stand Up Version, Side Adjust, Single Turn.

Note : To complete part number, please add resistance code (2 digits)

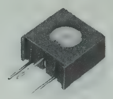
■ Dimensions

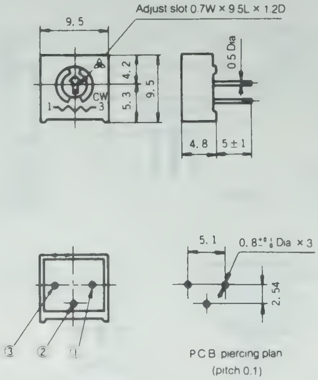
(unit : mm)

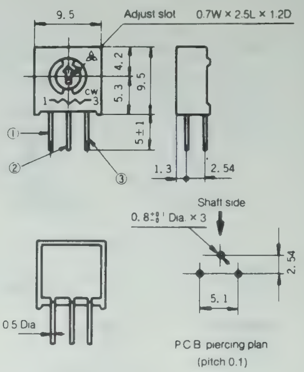
EVM-M0F



EVM-M1F







■ Specifications

Items	EVM-M1F/M0F
Resistance Range	100 to 1 MΩ
Tolerance	±10%
Taper	Linear
Residual Resistance	3% or 1Ω (whichever is bigger)
Wattage Rating	0.5W max. at 85℃
Voltage Rating	300V max.
TCR	±100PPM/℃
CRV	1% or 3Ω (whichever is bigger)
Rotation Torque	360 gf·cm max.
Stopper Strength	500 gf·cm min.
Rotation Angle*	300° nom., adj.
Operating Temperature	−55℃ to +125℃

*Mechanical Rotation 300°; Electrical Rotation 270°

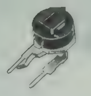
6MM Dia. Cermet Dust-Proof Type

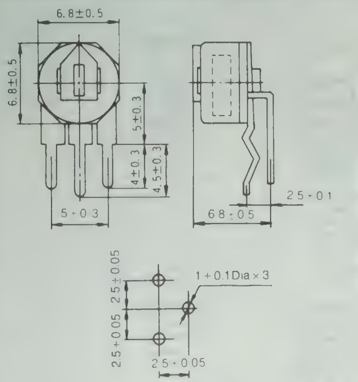
EVM-31GA00BXX......Stand Up Version, Side Adjust (both).
EVN-36CA00BXX......Lay Down Version, Top or Bottom Adjust.
Note: To complete part number, please add resistance code (2 digits).

■ Dimensions

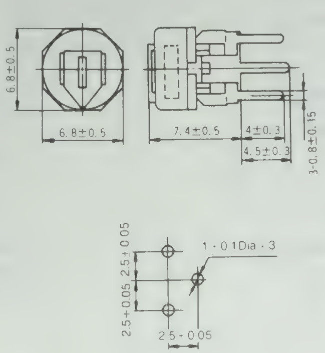
(unit: mm)

EVM-31G





EVN-36C



Cermet Trimmer Stock Resistance Values

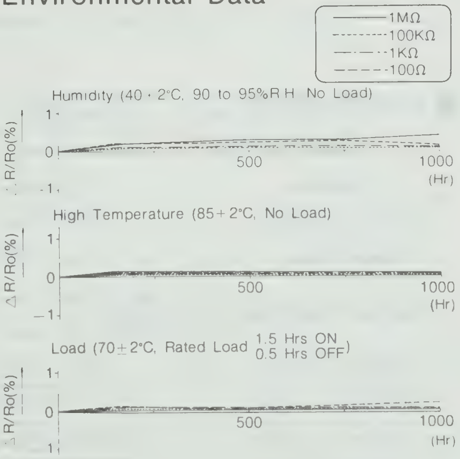
Value	Code
100Ω	12
200Ω	22
500Ω	52
1KΩ	13
2KΩ	23
5KΩ	53
10KΩ	14
20KΩ	24
25KΩ	F4
50KΩ	54
100KΩ	15
200KΩ	25
250KΩ	F5
500KΩ	55
1 Meg.Ω	16
*2 Meg.Ω	26

*EVM-S0G, Q0G, Q1G, MAG, MBG, MSG Only

■ Specifications

Items	31G/36C
Resistance Range	500 to 1 MΩ
Tolerance	±25%
Taper	Linear
Residual Resistance	2% max. or 10kΩ max. (whichever is smaller)
Wattage Rating	0.3W max. (70°C)
Voltage Rating	100V max.
TCR	±200PPM/°C ±300PPM/°C
CRV	5% max.
Rotationr Torque	20 to 250gf·cm
Stopper Strength	300gf·cm min.
Rotation Angle	200°±20°
Operating Temperature	−20°C to +100°C

■ Environmental Data



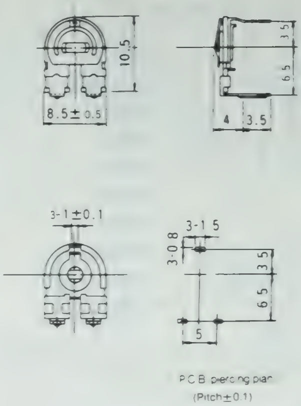
Carbon Series
8MM Open Frame Type

EVN-K4AA00BXX. . . . . . Lay Down Version, Top Adjust.
EVN-K0AA00BXX. . . . . . Stand Up Version, Side Adjust.

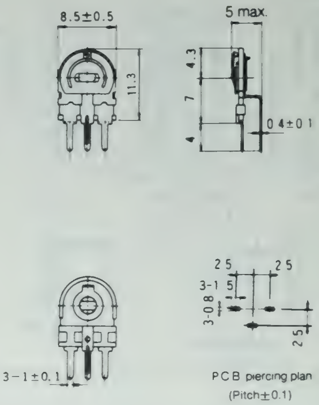
Dimensions:

(unit: mm)

EVN-K4A



EVN-K0A



Specifications

Taper	Linear
Tolerance	±30%
Working Voltage	200V max.
Power Rating	0.1w/ 50℃
Residual Resistance	up to 1kΩ: 10Ω max.
	over 1kΩ : 5% total res. max.
Rotation Angle	260° ±20%
Rotation Torque	30 to 300gf·cm
Stopper Strength	0.8kgf·cm min.
Operating Temo.	−25℃ to +75℃

EVN-K0A and K4A			
Stock Resistance Values			
Value	Code	Value	Code
300 Ω	32		
500 Ω	52	50 kΩ	54
1 kΩ	13	100 kΩ	15
2 kΩ	23	200 kΩ	25
5 kΩ	53	500 kΩ	55
10 kΩ	14	1 MΩ	16
20 kΩ	24	2 MΩ	26

Light Touch Switches
5MM Square Dust-proof Type
6MM Square Sealed Type

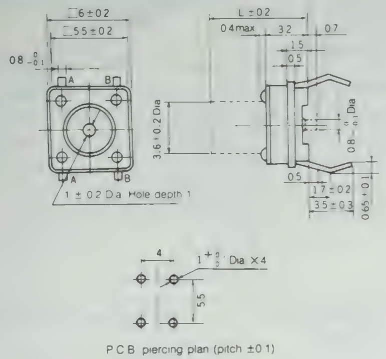
EVQ-QS205K
EVQ-QFR02K

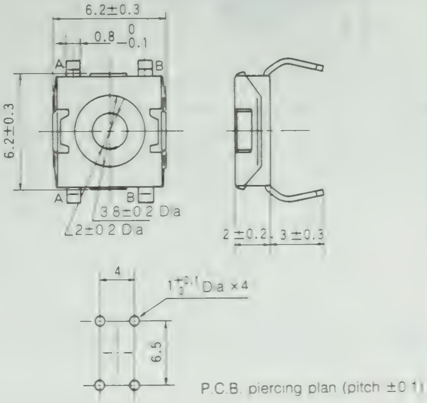
■ Dimensions

(unit: mm)

EVQ-QS2

EVQ-QFR

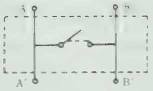




■ Specifications

Items	EVQ-QS2/EVQ-QFA
Switch Contact Rating	DC15V, 20mA
Chattering	3m sec. max. (when on)
Contact Resistance	50mΩ max./100mΩ max.
Insulation Resistance	50MΩ min. (DC100V)
Withstanding Voltage	AC250V (for 1 minute)
Switch Action	S.P.S.T. Momentary push on
Operating Force	130 ±30gf/130±40gf
Switch Travel (Stroke)	0.25 ±0.1 mm
Operating Life	100,000 min.
Operating Temp. Range	−20°C to +70°C

■ Switch schematics:



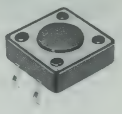
12MM Square Dust-proof Type

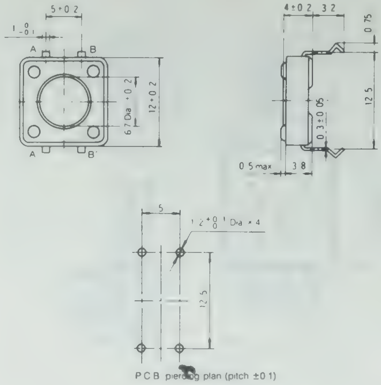
EVQ-PXR04K
EVQ-PYR12K

Dimensions:

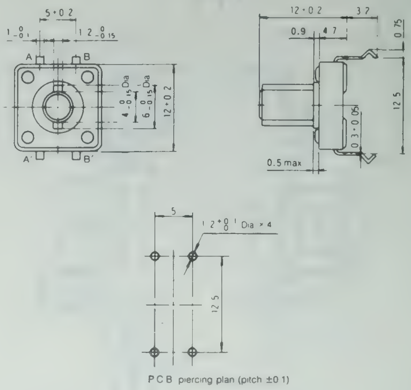
(unit: mm)

EVQ-PXR





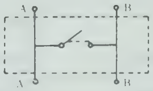
EVQ-PYR



Specifications

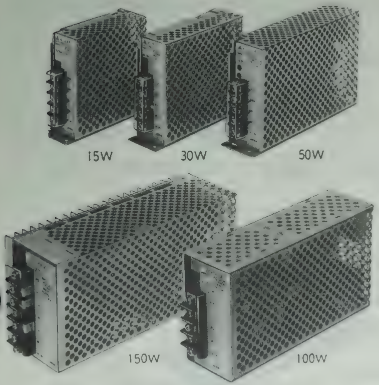
Items	EVQ-PXR/PYR
Switch Contact Rating	DC35V, 20mA
Chattering	3m sec. max. (when on)
Contact Resistance	50mΩ max.
Insulation Resistance	100MΩ min. (DC100V)
Withstanding Voltage	AC500V (for 1 minute)
Switch Action	S.P.S.T. Momentary push on
Operating Force	130 ±40gf
Switch Travel (stroke)	0.3±0.1mm
Operating Life	over 1,000,000 operation
Operating Tem. Rangee	−20°C to +70°C

Switch schematics:

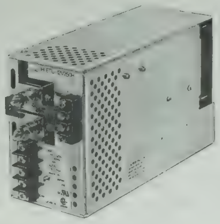


SWITCHING POWER SUPPLY SINGLE OUTPUT SERIES

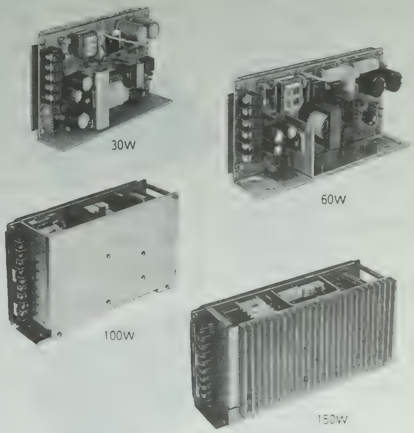
K series



V300 series



V series



Panasonic Single Output Power Supplies are offered in 52 models ranging from 15 to 300 watts. These supplies are compatible for a wide range of applications from Robotics and Environmental Control to Computer Systems and Digital Controllers. High switching frequency and tightly controlled regulation provide efficient dependable operation and superior performance.

Built to exceed all major safety assurance standards, Panasonic Single Output Power Supplies also conform to FCC and/or VDE noise specifications. For detailed evaluation, the following pages provide specific information each of Panasonic's Series of single Output Power Supplies.

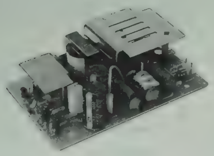
Series code	Part number	Out line of specification					Safety Approvals	EMI	Size (mm) (H×W×L)	Weight (kg)
		Input (AC)	Output (DC)	OVP	OCL			FCC/VDE		
K15W	ETU-5K30	85~132V	5V/3.0A	—	Short Circuit		UL/CSA	Class B	95×35×99	0.28
	ETU-12K13		12V/1.3A	—						
	ETU-15K10		15V/1.0A	—						
	ETU-24K07		24V/0.7A	—						
K30W	ETU-5K60	85~132V	5V/6.0A	○	Short Circuit		UL/CSA	Class B	95×35×117	0.33
	ETU-12K25		12V/2.5A	○						
	ETU-15K20		15V/2.0A	○						
	ETU-24K13		24V/1.3A	○						
K50W	ETU-5K100	85~132V	5V/10.0A	○	Short Circuit		UL/CSA	Class B	95×37×159	0.48
	ETU-12K42		12V/4.2A	○						
	ETU-15K34		15V/3.4A	○						
	ETU-24K21		24V/2.1A	○						
K100W	ETU-5K200	85~132V	5V/20.0A	○	Short Circuit		UL/CSA	Class B	95×50×183	0.65
	ETU-12K80		12V/8.0A	○						
	ETU-15K65		15V/6.5A	○						
	ETU-24K40		24V/4.0A	○						
K150W	ETU-5K300	85~132V	5V/30.0A	○	Short Circut	Remort Sensing	UL/CSA	Class B	95×65×208	0.9
	ETU-12K125		12V/12.5A	○						
	ETU-15K100		15V/10.0A	○						
	ETU-24K65		24V/6.5A	○						

Series code	Part number	Out line of specification					Safety Approvals	EMI	Size (mm) (H×W×L)	Weight (kg)
		Input (AC)	Output (DC)	*OVP	*OCL	Signal		FCC/VDE		
J20W	ETU-5J40H	98~132V	5V/4.0A	×	–		UL/CSA	Class A	100×35×160	0.45
	ETU-12J18H		12V/1.8A	×	–					
	ETU-15J15H		15V/1.5A	×	–					
	ETU-24J10H		24V/1.0A	×	–					
J50W	ETU-5J100H	98~132V	5V/10.0A	×	–		UL/CSA	Class A	100×45×185	0.72
	ETU-12J40H		12V/4.0A	×	–					
	ETU-15J35H		15V/3.5A	×	–					
	ETU-24J20H		24V/2.0A	×	–					
V30W	ETU-5V60	85~132V 170~264V	5V/6.0A	×	×		UL/CSA	Class B	100×45×170	0.5
	ETU-12V25		12V/2.5A	×	×					
	ETU-15V20		15V/2.0A	×	×					
	ETU-24V13		24V/1.3A	×	×					
V60W	ETU-5V120	85~132V 170~264V	5V/12.0A	×	×		UL/CSA TÜV	Class A	100×55×205	0.75
	ETU-12V50		12V/5.0A	×	×					
	ETU-15V40		15V/4.0A	×	×					
	ETU-24V25		24V/2.5A	×	×					
V100W	ETU-5V200	85~132V 170~264V	5V/20.0A	×	×		UL/CSA TÜV	Class A	120×55×197	1.2
	ETU-12V80		12V/8.0A	×	×					
	ETU-15V65		15V/6.5A	×	×					
	ETU-24V40		24V/4.0A	×	×					
V150W	ETU-5V300	85~132V 170~264V	5V/30.0A	×	×		UL/CSA TÜV	Class A	120×66×230	1.6
	ETU-12V125		12V/12.5A	×	×					
	ETU-15V100		15V/10.0A	×	×					
	ETU-24V65		24V/6.5A	×	×					
V300W	ETU-5V600H	85~132V	5V/60.0A	×	×		UL/CSA	Class A	130×83×250	2.0
	ETU-12V250H		12V/25.0A	×	×					
	ETU-15V200H		15V/20.0A	×	×					
	ETU-24V125H		24V/12.5A	×	×					
	ETU-5V600	170~264V	5V/60.0A	×	×		UL/CSA TÜV	Class A	130×83×250	2.0
	ETU-12V250		12V/25.0A	×	×					
	ETU-15V200		15V/20.0A	×	×					
	ETU-24V125		24V/12.5A	×	×					

*OVP……Over Voltage Protection
*OCL……Over Current Limiter

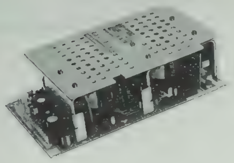
Switching Power Supply Multiple Output Series

MN series

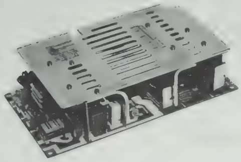


MP series

MR series



MS series



Panasonic Multiple Output power Supplies are ideal for use in Medical and Instrumentation Systems, Computers and Robotics. The compact size and light weight of Panasonic Power Supplies make them well suited for today's space-efficient products. Our multiple output P/S are offered in 16 models, from 40 to 100 watts accommodating a wide range of applications.

In addition, they conform to all pertinent FCC and VDE noise specifications Our Power supplies meet all the required Safety approvals as well as standard overcurrent protection. As an added safety benefit, overvoltage protection is also provided on the main output for MN, MP, MR and MS Series. For an itemized assessment, the following pages contain specific details on each of Panasonic's Series of Multiple Output Power Supplies.

Series code	Part number	Out line of specification						Safety approvals	EMI	Size (mm) (H×W×L)	Weight (kg)
		Input (AC)	Output (DC)		OVP	OCL	Signal*		FCC/VDE		
MN40W	ETU-3MN04UP	85~132V/170~264V	1	5V/0.5−3.0A	×	Short Circuit	–	UL/CSA TÜV/VDE	Class B	47.6×100×160	0.35
			2	12V/0.3−2.0A	–						
			3	−12V/0.04−0.1A	–						
MP50W	ETU-3MP01UP	85~132V/170~264V	1	5V/1−6.0A	×	Short Circuit	POR	UL/CSA TÜV	Class B (FCC)	46.1×108×197	0.5
			2	12V/0.5−2.5A	–						
			3	−12V/0−0.5A	–						
	ETU-3MP53UP		1	5V/1.0−6.0A	×		POR		Class B (FCC/VDE)		
			2	12V/0−0.5A	–						
			3	−12V/0−0.5A	–						
	ETU-4MP01UP		1	5V/1.0−6.0A	×		POR		Class B (FCC)		
			2	12V/0.5−2.5A	–						
			3	−12V/0−0.5A	–						
			4	−5V/0−0.5A	–						
	ETU-4MP03UP		1	5V/1.0−6.0A	×		POR		Class B (FCC/VDE)		
			2	12V/0.5−2.5A	–						
			3	−12V/0−0.5A	–						
			4	−5V/0−0.5A	–						

Series code	Part number	Out line of specification						Safety approvals	EMI	Size (mm) (H×W×L)	Weight (kg)
		Input (AC)	Output (DC)		*OVP	*OCL	Signal		FCC/VDE		
MR75W	ETU-4MR01UP	85~132V/170~264V	1	5V/1.4−7.0A	×	Short Circuit	*POR	UL/CSA TÜV	Class B (FCC/VDE)	57.1×108×197	
			2	12V/0.6−3.0A	−						
			3	−5V/0−0.5A	−						
			4	−12V/0−2.0A	−						
	ETU-4MR03UP		1	5V/1.4−7.0A	×		POR				
			2	12V/0.6−3.0A	−						
			3	−12V/0−0.5A	−						
			4	12V/0−2.0A	−						
	ETU-4MR05UP		1	5V/1.4−7.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−5V/0−0.5A	−						
			4	12V/0−0.2A	−						
	ETU-4MR07UP		1	5V/1.4−7.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−12V/0−0.5A	−						
			4	12V/0−2.0A	−						
	ETU-4MR09UP		1	5V/1.4−7.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−15V/0−0.5A	−						
			4	15V/0−2.0A	−						
MS100W	ETU-4MS01UP	85~132V/170~264V	1	5V/2.4−12.0A	×	Short Circuit	POR	UL/CSA TÜV	Class B (FCC/VDE)	57.1×114×210	
			2	12V/0.6−3.0A	−						
			3	−5V/0−0.5A	−						
			4	−12V/0−2.0A	−						
	ETU-4MS03UP		1	5V/2.4−12.0A	×		POR				
			2	12V/0.6−3.0A	−						
			3	−12V/0−0.5A	−						
			4	12V/0−2.0A	−						
	ETU-4MS05UP		1	5V/2.4−12.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−5V/0−0.5A	−						
			4	12V/0−2.0A	−						
	ETU-4MS07UP		1	5V/2.4−12.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−12V/0−0.5A	−						
			4	12V/0−2.0A	−						
	ETU-4MS09UP		1	5V/2.4−12.0A	×		POR				
			2	24V/0.3−1.5A	−						
			3	−15V/0−0.5A	−						
			4	15V/0−2.0A	−						

*POR ……Power On Ready

*OVP……Over Voltage Protection
*OCL……Over Current Limiter

■Safety Agencies

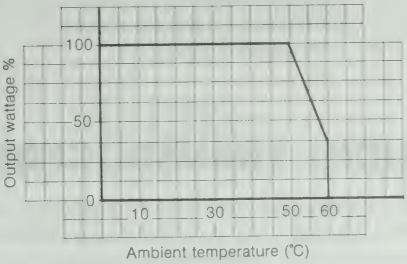
	K	J	V	300W	MN	MP	MR	MS
UL 114	○	○	○	∗1	○	○	○	○
478	○	○	○	∗1	○	○	○	○
CSA 22, 2, 153	○	○	○	∗1	○	○	○	○
TÜV IEC 380			○	∗2	○	○	○	○

∗1 : 100V type ∗2 : 200V type.

■Derating characteristics

Single Output Series Deratins

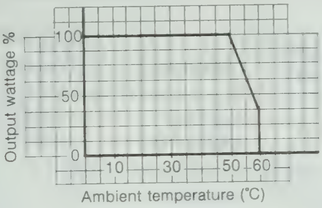
Derating characteristics (convection cooling)



Multiple Output Series Deratins

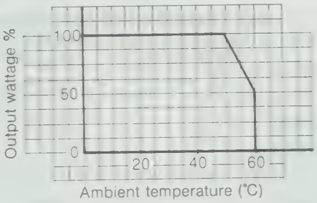
MN Series

Derating characteristics (convection cooling)



MP, MR, MS Series

Derating characteristics (convection cooling)



■Warranty and RMA

Return Material Authorization : All Panasonic products require a Return Material Authorization number prior to shipments to Panasonic. Before a RMA number will be issued a request must be sent in writing to PIC referencing purchase order number, part number, quantity and detailed reason for return.

PIC warrants Panasonic Switching Power Supplies to Purchasers for a period of three (3) years from the date of manufacture (as indicated by the date code marking on each such product), or two (2) years from the date of original purchase from PIC, whichever is longer.

INTRODUCTION

Panasonic electronic audio transducers, and buzzers are compact, offer solid-state reliability, and can be mounted in a variety of ways. They can operate over a wide temperature range in a variety of equipment and applications. Their small size, and weight, low power consumption, inherent vibration resistance make them ideally suited for many uses proviously requiring bulky and expensive speakers or electro-mechanical devices. And like all Panasonic products they are backed by stringent quality-control standards and a name you can trust.

APPLICATIONS

Miniature audio transducers and Electronic buzzers :

- Burglar alarms
- Paging systems
- Smoke and fire detectors
- Gas (pollutant) detectors
- Light and radiation detectors
- Data entry terminals
- Various electronic equipment
- Alarm clocks
- Telephones
- VTR cameras
- Automotive warning systems
- Production machinery
- Test instruments
- Cash registers
- Fish finders
- Metal detectors
- Medical equipments

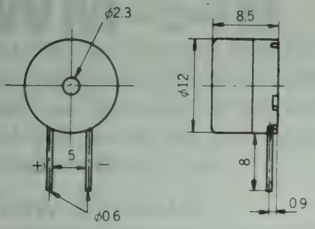
MINIATURE AUDIO TRANSDUCERS

Miniature audio transducers are very small and light, offer high efficiency, and consume very little power. Due to their total solid-state construction, they feature long life and highly reliable performance. Since they come with a variety of terminals, they can be mounted in different ways, including direct mounting on printed circuit boards.

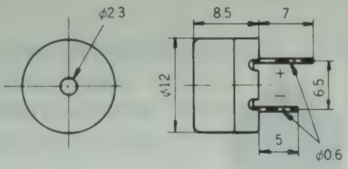
Miniature Audio Transducers for General Application

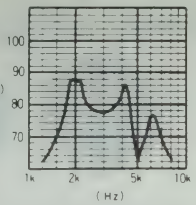
Part No.	Rated Input (m VA)	S.P.L (dB) at 0.1m(4inches)	Impedance (Ω)	Frequency (Hz)	Terminal	Feature
EAF-12RT04BB	50	85dB	80	2048	Bent Pin	
EAF-12RT04CC					Straight Pin	
EAF-12RF04B	50	86dB (50mW, 4.1kHz)	35Ω/4.1kHz	3.8k~4.3k	Bent Pin	
EAF-12RF04C					Straight Pin	
EAF-14R06B	50	93dB (50mW, 2.5~3kHz)	45Ω/3kHz	2.4k~3.3k	Bent Pin	
EAF-14R06C					Straight Pin	
EAF-14RM06CN					Straight Pin	Heat Resistance
EAF-14RM06CT	50	93dB (50mW, 2.5~3kHz)	45Ω/3kHz	2.4k~3.3k	Straight Pin	Washable
EAF-14R06CW					Straight Pin	Washable Heat Resistance
EAF-16R02C	50	95dB (50mW, 2.5~3kHz)	45Ω/3kHz	2.5k~3.0k	Straight Pin	
EAF-20R01C	100	94dB (100mW, 1.8~2.5kHz)	25Ω/2kHz	1.8k~3.0k	Straight Pin	

EAF-12RT04BB

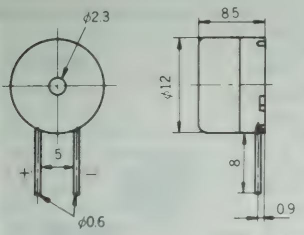


EAF-12RT04CC

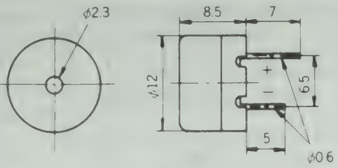


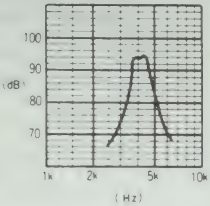

(sine wave 1.5Vrms without baffle)

EAF-12RF04B

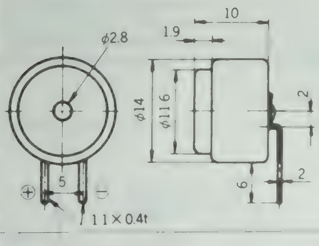


EAF-12RF04C

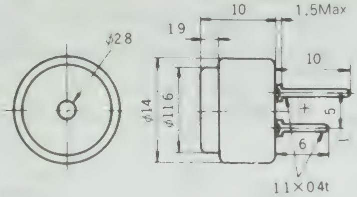


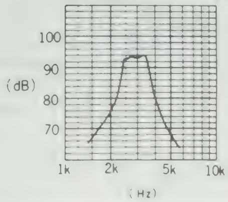

(sine wave 1.5Vrms without baffle)

EAF-14R06B

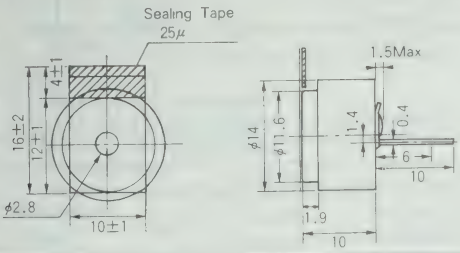


EAF-14R06C
EAF-14RM06CN

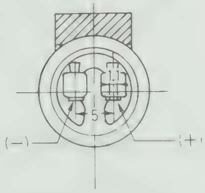


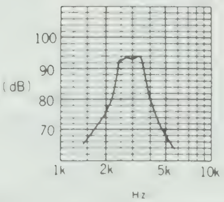

(sine wave 1.5Vrms without baffle)

EAF-14RM06CT

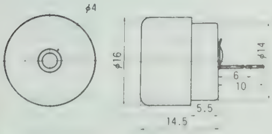


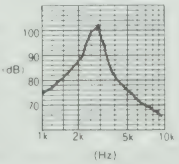
EAF-14R06CW



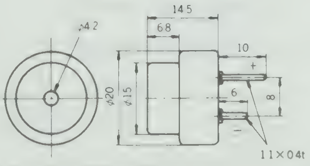

(sine wave 1.5Vrms without baffle)

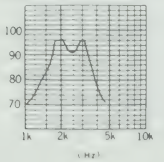
EAF-16R02C



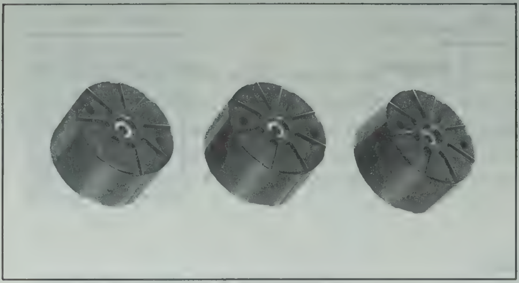

(sine wave 1.5Vrms without baffle)

EAF-20R01C



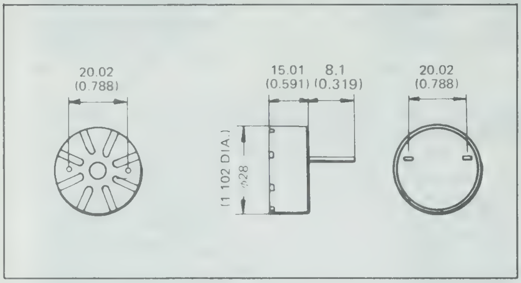

(sine wave 1.5Vrms without baffle)

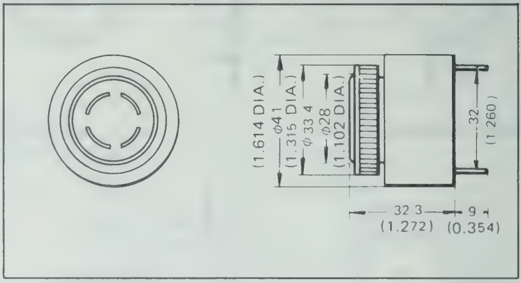
Electronic Buzzers



PART No.	VOLTAGE (VDC)			CURRENT (mA)			*S.P.L.(dB) at 0.1m (4 inches) with Baffle	ACOUSTIC	Signal	WEIGHT g(oz)
	Min.	Normal	Max.	Min.	Normal	Max.		Tone Frequency (kHz)		
EAL-030A	2	3	4	26	38	51	90	2.8	Continuous	10(0.35)
EAL-060A	4	6	8	17	25	33	92	2.8	Continuous	10(0.35)
EAL-120A	9	12	15	23	30	38	96	2.8	Continuous	10(0.35)
EAL-030B	2	3	4	5	8	11	83	2.8	Intermittent	10(0.35)
EAL-060B	4	6	8	6	8	11	85	2.8	Intermittent	10(0.35)
EAL-120B	9	12	15	7	9	12	87	2.8	Intermittent	10(0.35)

* "Normal" operating conditions





PART No.	VOLTAGE (VDC)			CURRENT (mA)			*S.P.L (dB) at 0.5m (20 inches) with Baffle	ACOUSTIC	Signal	WEIGHT g(oz)
	Min.	Normal	Max.	Min.	Normal	Max.		Tone Frequency (kHz)		
EAL-039A	2	3	4	24	35	47	92	2.8	Continuous	25(0.88)
EAL-069A	4	6	8	20	30	40	94	2.8	Continuous	25(0.88)
EAL-129A	9	12	15	18	23	29	98	2.8	Continuous	25(0.88)
EAL-039B	2	3	4	5	7	10	88	2.8	Intermittent	25(0.88)
EAL-069B	4	6	8	5	7	10	90	2.8	Intermittent	25(0.88)
EAL-129B	9	12	15	6	7	9	92	2.8	Intermittent	25(0.88)

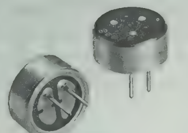
* "Normal" operating conditions

Omnidirectional Electret Condenser Microphone Cartridge

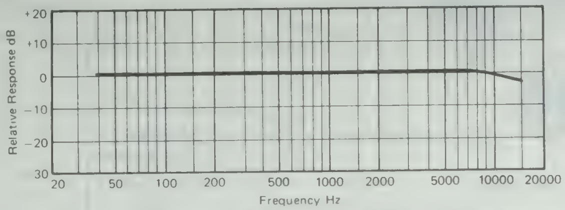
WM-54B

WM-54B microphone series adopts newly developed structure to realize thin style, high performance and inexpensive Electret Condenser Microphone.
Also can be used for automatic soldering process to solder lead pins of microphone.
WM-54B series are low voltage operation microphone (2.5V) and suitable for Tape Recorders, Telephones and Toys.

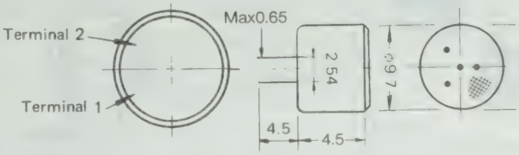
New Product

Models	Sensitivity	
	X	−66±3dB
	T	−64±3dB
	Y	−62±3dB
	U	−60±3dB
	M	−64±2dB
	H	−62±2dB

Typical Frequency Response Curve



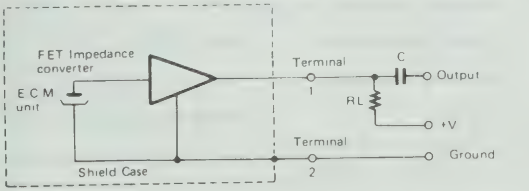
Unit : mm



Applications

1. Telephone and telephone answering devices
2. Built in microphones for tape recorders
3. Intercoms
4. Modems for computers
5. Completed microphones for redcording, testing, and monitoring
6. Hearing aids
7. Sonic controlled toys and sensors
8. Others

Schematic Diagram



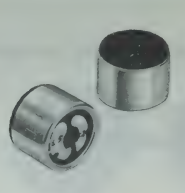
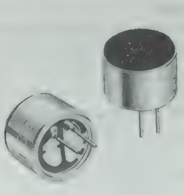
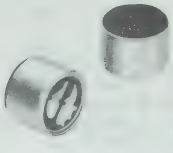
RL＝2 2kΩ (External resistor)

Specifications

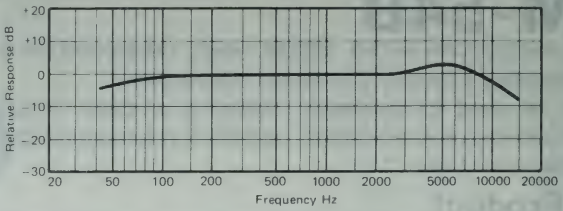
WM-54B

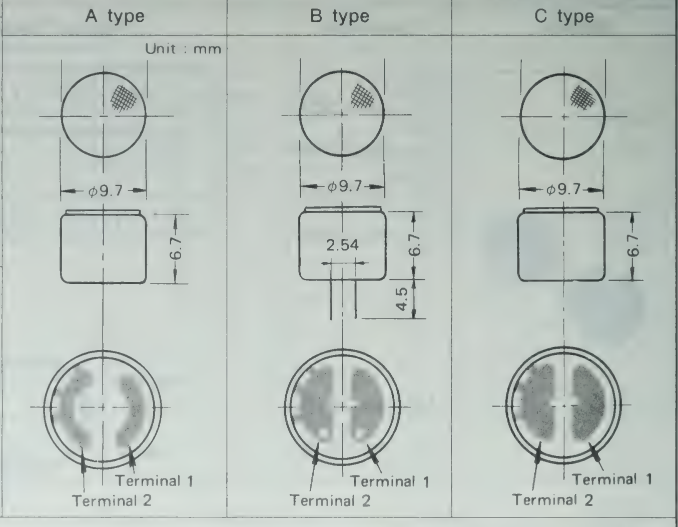
Sensitivity:	See above (0dB＝1V/μbar, 1kHz)
Impedance:	Low impedance
Directivity:	Omnidirectional
Frequency:	20-16,000Hz
Max. operation voltage:	10V
Standard operation voltage:	2.5V
Current consumption:	Max. 0.6mA
Sensitivity reduction:	Within −3dB at 2V
S/N ratio:	More than 40dB

Omnidirectional Electret Condenser Microphone Cartridge WM-034

Models	Sensitivity
 WM-034A	X −66±3dB Y −62±3dB Z −58±3dB
 WM-034B	X −66±3dB Y −62±3dB Z −58±3dB
 WM-034C	X −66±3dB Y −62±3dB Z −58±3dB

Typical Frequency Response Curve





*Providing ±2dB deviation models in A, B and C type according to your request. Example : WM-034CY102 (−62±2dB)

Applications

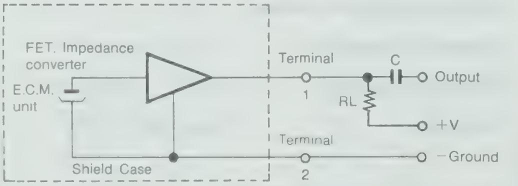
1. Telephone and telephone answering devices
2. Built in microphones for tape recorders
3. Intercoms
4. Modems for computers
5. Completed microphones for redcording, testing, and monitoring
6. Hearing aids
7. Sonic controlled toys and sensors
8. Others

Specifications

WM-034A.B.C.

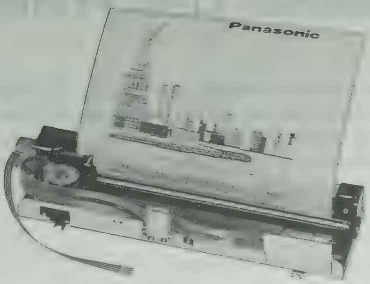
Sensitivity :	See above (0dB=1V/μbar, 1kHz)
Impedance :	Low impedance
Directivity :	Omnidirectional
Frequency :	20-16,000Hz
Max. operation voltage :	10V
Standard operation voltage :	4.5V
Current consumption :	Max. 0.8mA
Sensitivity reduction :	Within −3dB at 3V
S/N ratio :	More than 40dB

Schematic Diagram



RL=2.2kΩ (External resistor)(A.B.C TYPE)

New Serial Printer EPT-1000 Series



The various types of serial printers can be produced by the combination of standarlized basic components and meet the application in various fields.
According to your applications, you can choose the most suitable printer out of our standard models. Two types of this series are available; "H-series" with two step motors are for a graphic mode printing at high speed, and "L-series" with single one at lower cost.
The three types of 58 mm, 80 mm, 112 mm in paper width are available for both types of H-series and L-series.

Features

- High-speed printing of 70pcs
- Extermely clear printing
- Quiet printing (Achieved by step motor driving)
- Compact size and light weight
- Single operating voltage (DC5V possible for battery operation)
- Low cost

Applications

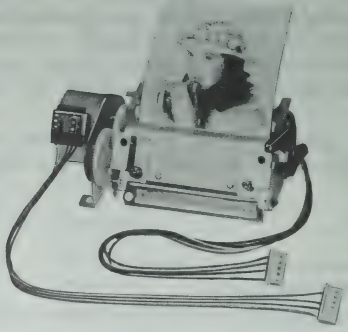
- Measuring and analysis instruments
- Medical equipments
- Copier of CRT
- POS data communication peripherals
- Microcomputer peripherals

Printer Specifications

Item	L Series			H Series			Remarks
	EPT-1014LW2(G)*	EPT-1019LW3(G)*	EPT-1025LW4(G)*	EPT-1014HW2	EPT-1019HW3	EPT-1025HW4	
Printing Method	Serial and thermal type			Serial and thermal type			
Printing Direction	Left → right			Character : Bi-directional Logical Seek Graphic : Uni-directional Logical Seek			
Paper Width	58 mm	80 mm	112 mm	58 mm	80 mm	112 mm	
Head	Character : 7 dots Vertical Graphic : 8 dots Vertical			8 dots Vertical			
Character Construction	7×5 dots			7×5 dots			Vertical× Horizontal
Character Size	2.3×1.5 mm			2.3×1.5 mm			Vertical× Horizontal
Total Number of Dots	144	192	256	144	192	256	
Vertical Dot Pitch	P = 0.33 mm			P = 0.33 mm			Vertical pitch
Total Number of Dots Number of Characters per Line	24	32	42	24	32	42	Space : 1 dot
Printing Speed	70 pcs			70 pcs			
Paper Feed System	Friction			Friction			
Paper Feed Pitch	3.6, 2.4 mm			0.33/4 mm			
Operating Voltage (V)	4.0~5.5	4.5~5.5		4.0~5.5	4.5~5.5		AT FPC Terminal
Weight (g)	70	85	100	80	95	110	
External Dimensions	84×40 ×19.5	104×40 ×19.5	136×40 ×19.5	96×40 ×19.5	116×40 ×19.5	149×40 ×19.5	W × D × H

High Speed
Thermal Line Printer EPL-1000 Series

Enabling graphic printing at higher density as compared with the conventional serial head thermal printer. Printing speed is about 10 to 15 times faster than usual thermal printers. and lower noise, many other excellent features.



Features

- High speed, 60 mm/sec.
- High-density printing of 6 dots/mm
- Small size, light weight and low profile
- Low noise
- Possible of both horizontal and vertical mounting.
- Function of detecting the head up/down condition
- Function of detecting the paper end (optional)
- Function of detecting the head temperature

Applications

- Measuring instruments, analyzers, ME equipment, data terminals and portable equipment.

Interface

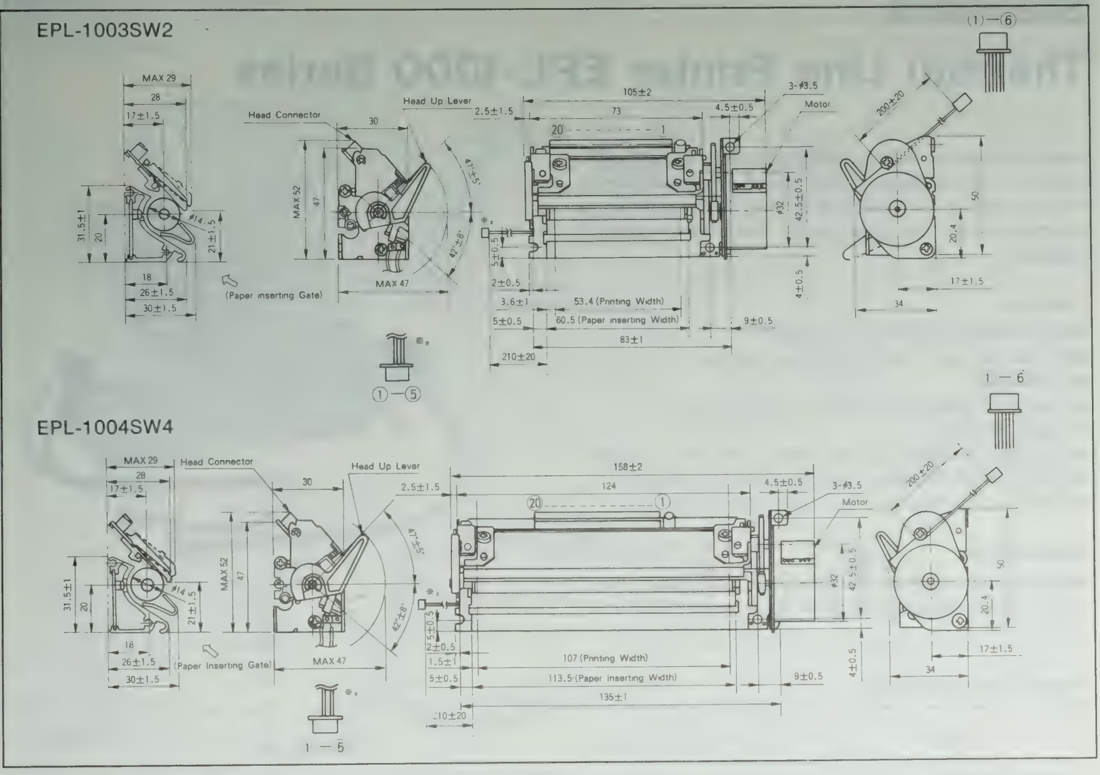
- Common interface to 60-mm and 120-mm paper width printers.

Printer Specifications

Item		Specifications		Remarks
		EPL-1003SW2 (P)※	EPL-1004SW4 (P)※	
Printing Method		Thermal 6 dots/mm		
Character Composition		Character printing 16×15 dot matrix		Example
Paper Width		60mm	112mm	
Effective printing Width		53.4mm	106.86mm	
Total Number of Lateral Dots		320 dots/line	640 dots/line	
Printing Number of Characters		20 characters (15-dot printing+one-dot space)	40 characters (15-dot printing+one-dot space)	Example
Paper Feed System		Friction feed system		
Paper Feed Pitch		0.167mm (1/1dot)		
Printing Speed		360dots line/sec (Printed one time)	360dots line/sec (Printed one time)	
Motor	Voltage	DC24V+5%		
	Current	760mA (68Ω)	760mA (68Ω)	
Paper Feed Force		50 g min.		
Weight		200g approx	300g approx	
External Dimensions		105×52×34mm	158×52×34mm	
Life		3×10^7 pulses MCTF		• Normal temp. & humidity • Rated energy

※ Paper end Senser (option)

Printer Outside Dimentions



Interface Specifications

Interface unit : EPL-R1010 Series

This interface unit EPL-R1010 series is the control board for the High Speed thermal line printer EPL-1000 series.

This interface, incorporating an 8-bit microcomputer, is responsible for :

Receiving the data from the user's system (compatible to Centronics or RS-232C) and controlling the printer.

Applicable printers : EPL-1003SW2 (P) 2-inch printer EPL-1004SW4 (P) 4-inch printer

Features The features of this interface unit include the following.

(1) Centronics compatible, RS-232C compatible

(2) One-line data buffer

(3) 353-character generator

(4) Self-testing function

(5) Various kinds of control command

(6) Compensatory function of applied energy to head
   - ◦ Head temperature compensation : Self-correction by thermistor control

(7) Head heat control
   - ◦ Head storage control of thermal head. Checking the history of head coloring (up to 2 dots before), the energy applied to the head is the controlled.
   - · Printing rate control : Checking the ratio of presence and absence of head coloring, the energy applied to the head is controlled.

(8) Protecting functions for the head
   - ◦ Head temperature protection
   - · Protection of head from breakdown due to runaway of microcomputer

(9) Motor protective circuit function
   - ◦ Protection of motor from breakdown due to runaway of microcomputer

Standard
Thermal Line Printer EPL-1000 Series

Enabling graphic printing at higher density as compared with the conventional serial head thermal printer. Printing speed is about 5 to 6 times faster than usual thermal printers. and lower noise, many other excellent features.

Features

- High-density printing of 6 dots/mm
- Small size, light weight and low profile
- Low noise
- Two-path system adapted to thick paper (Label Paper)
- Function of detecting the head up/down condition
- Function of detecting the paper end (optional)
- Function of detecting the head temperature

Applications

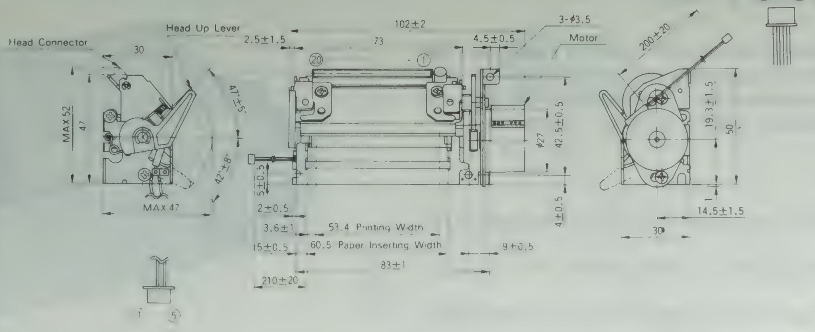
- Measuring instruments, analyzers, ME equipment, data terminals and portable equipment.

Printer Specifications

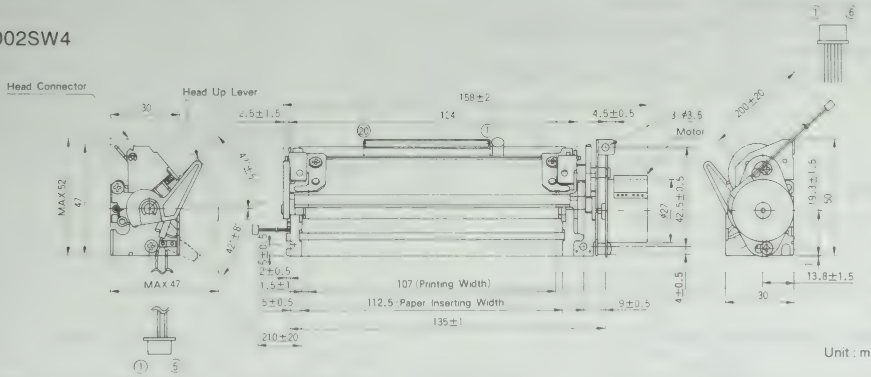
Item		Specifications		Remarks
		EPL-1001SW2	EPL-1002SW4	
Printing Method		Thermal 6 dots/mm		
Character Composition		Character printing 14×10 dot matrix		Example
Paper Width		60mm	112mm	
Effective Printing Width		53.4mm	106.86mm	
Total Number of Lateral Dots		320 dots/line	640 dots/line	
Printing Number of Characters		22 characters (10-dot printing +4-dot space)	44 characters (10-dot printing +4-dot space)	Example
Paper Feed System		Friction feed system		
Paper Feed Pitch		0.167mm (1/1dots)	0.083mm (1/2dot)	
Printed Speed		139 dots line/sec (2 divisions)	69 dots line/sec (4 divisions)	
Motor	Voltage	24V± 5%	24V ±5%	
	Current	230 mA (210Ω)	230 mA (210Ω)	
Paper Feed Force		50 g min.		
Weight		180 g approx.	280 g approx.	
External Dimensions		102×52×30 mm	158×52×30 mm	Refer to Appearance Drawing.
Life		3×10^7 pulses MCTF		• Normal temp. & humidity • Rated energy

Printer Outside Dimensions

EPL-1001SW2



EPL-1002SW4



Unit : mm

Interface Specifications

Interface unit EPL-R1000 Series

The interface EPL-R1000 series is designed to control the line printers EPL-1000 series. This interface board including single chip 8-bit microcomputer, character generator, control program for printer mechanism and I/O interface control. Interface to host computer can get through centronics 8-bit parallel interface (Centronics Compatible).

Features

(1) Centronics compatible

(2) Applicable for both mechanisum
  EPL-1001SW2 (2″)
  EPL-1002SW4 (4″)

(3) One line data buffer memory

(4) 160 character generator

(5) Self testing function

(6) Various kinds of control command

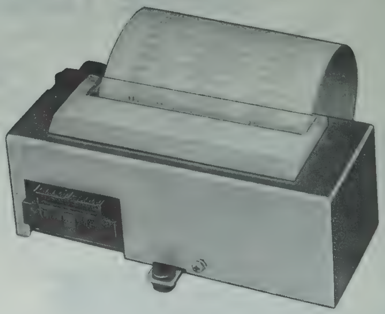
(7) Compensatory functions of applied energy to head.
  Variance of head resistance : by Dip SW.
  Variance of temperature : Self-adgustment by thermistor.

(8) Protecting functions for the head.
  High and low temperature limit function.
  Stopping function at paper end and head up position.

(9) Easy re-set function.

3-inch Printer Series EUY-3T

A quiet thermal printer for 80mm width paper with the maximum printing capacitance of 40 characters per line. It is easy to operate and can be used for a wide variety of purposes because graphic printing is possible.



Features

- Quiet printing due to thermal printing. Requires no ink ribbons.
- 9-dot head capable of both graphic and character printing.
- Clear and easy-to-read printing due to 40 characters/line on 80mm-wide paper.
- Economical to use a single 5V power source. Suitable for battery operation.
- Bi-direction print-from left and from right-is possible.

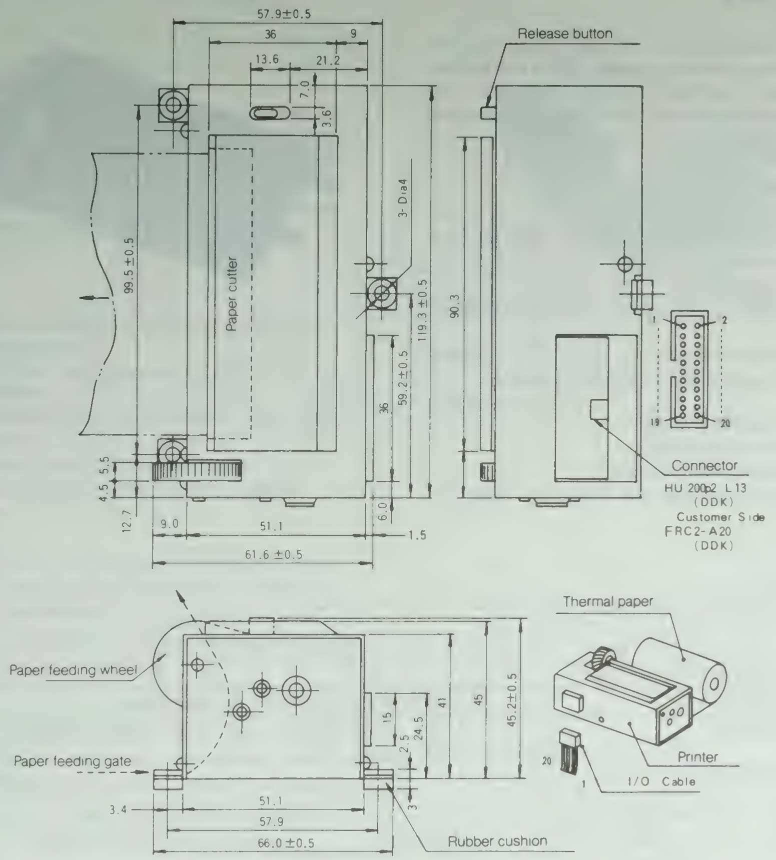
Applications

- Output of hard copies of CRT displays
- Peripherals of portable computers and personal computers.
- Peripherals for measuring instruments and analyzing equipment.
- Communication peripherals, etc.

Specifications

Items	Specification		Remarks
Printing Method	Serial and thermal types		
Number of Characters per Line	32, 40		256, 280 dots
Kind of Characters	Graphics, simbols and alphanumerics		
Printing Mode	Graphic printing	9 dots	8-dot graphic printing available.
	Character printing	7 dots (5×7 matrix)	
Printing Speed	1.2 lines/sec		
Recording Paper Feeding Amount	9-dot Heigh 3.5mm 7-dot Heigh 2.7mm		
Voltage	4.75 ± 0.3V DC		
Current	Motor peak 1.5A (Average 0.2A) Head 0.46A max/dot		
Life	1×10^6 line (MCTF)		Replacement of printing head required.
Outside Dimensions (max)	121W×67D×48.5H (mm)		
Weight	Approx. 400g		
Recording Paper	Paper Width 80 mm TP50KS-5D (JUJO) PS65B1 (HONSHU) F200U7X (MITSUBISHI)		

Dimensions



Unit: mm

Arrangement of Connector Terminals

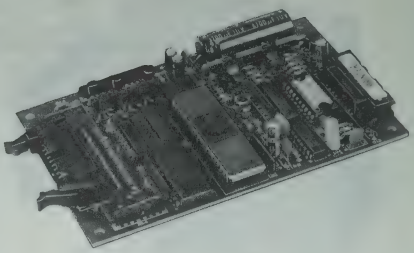
(Connector of host system side)

Pin No.		Pin No.	
1	DATA 1 input	2	DATA 2 input
3	DATA 3 input	4	DATA 4 input
5	DATA 5 input	6	DATA 6 input
7	DATA 7 input	8	DATA 8 input
9	$\overline{\text{STROBE}}$ input	10	$\overline{\text{ACK}}$ output
11	BUSY output	12	$\overline{\text{PAPER FEED}}$ input
13	$\overline{\text{RESET}}$ input	14	L-SW output
15	No connection	16	R-SW output
17	+5V *1	18	+5V *1
19	GND *2	20	GND *2

Both *1 and *2 should be connected to +5V or GND.

Series 351(EUY-PUD351A) for EUY-3T

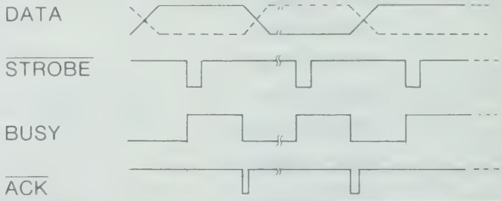
Contribution to rationalization of the designing this 3-inch thermal printer interface series 350 is compatible with a centronics interface in both software and hardware. It can print characters when directly connected to various types of personal computers.



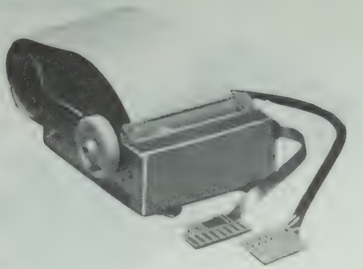
Features

- Multi-functions and compact size by use of 8-bit, 1-chip microcomputer.
- Centronics interface.
- Hand-shake control of 8-bit data, STROBE and ACK/BUSY.
- Built-in 1-line buffer memory . . . . 40 digits
- Alphanumerics (capital and small) and symbols . . . . 128 characters
- Character and graphic printing.
- Bi-directional printing control.
- Equipped with paper feeding input.
- Both printer and interface are driven by mere 5V power source.

Specifications

Items			EUY-PUD351A	
Printer			EUY-3TS4028, 4029, 3238, 3239	
Number of Characters per Line			32 · 40	
Printing Direction			bi-directional	
Characters Code			ASCII, JIS-C6220 (8-bit parallel)	
Printing Commencement			① When 1-line buffer memory is full. ②During input of control code LF(OA), CR(OD)	
Data Transmission Signal	Data input		8-bit Data active high	
	Control signal	Strobe input	Active low	Data plant start signal
		Acknowledge output	Active low	When data planting is completed a negative pulse is output.
		Ready output	Active high	High level when data are being planted and printer is operating.
Timing				
Power Source			+5V ±5% 4A max	
Dimensions			85(W)×133(D)×22(H)mm	
Weight			Approx. 110g	
Operating environments	Temperature		0~50℃	
	Humidity		30 ～ 90% RH at 40℃	

Mini Printer
(Series EUY-10E/10T)



Wide range of applications

Extremely compact and lightweight compared to mechanical (impact) printers. They are economical in price and can be used for a wide variety of purposes such as recording computers, pocket calculators, CPU terminals, measuring instruments, analyzing equipment, medical equipment, microcomputers, etc.

Features

- Quiet printing.
- Small, lightweight, low power consumption and low voltage. Battery operation.
- The character which is composed of the 7 × 5 dot matrix is easy to read.
- Wide selection of character types allows usage for a variety of equipment.
- A model permitting graphic printing available.
- 2 types-electrosensitive and thermal-are available.

Applications

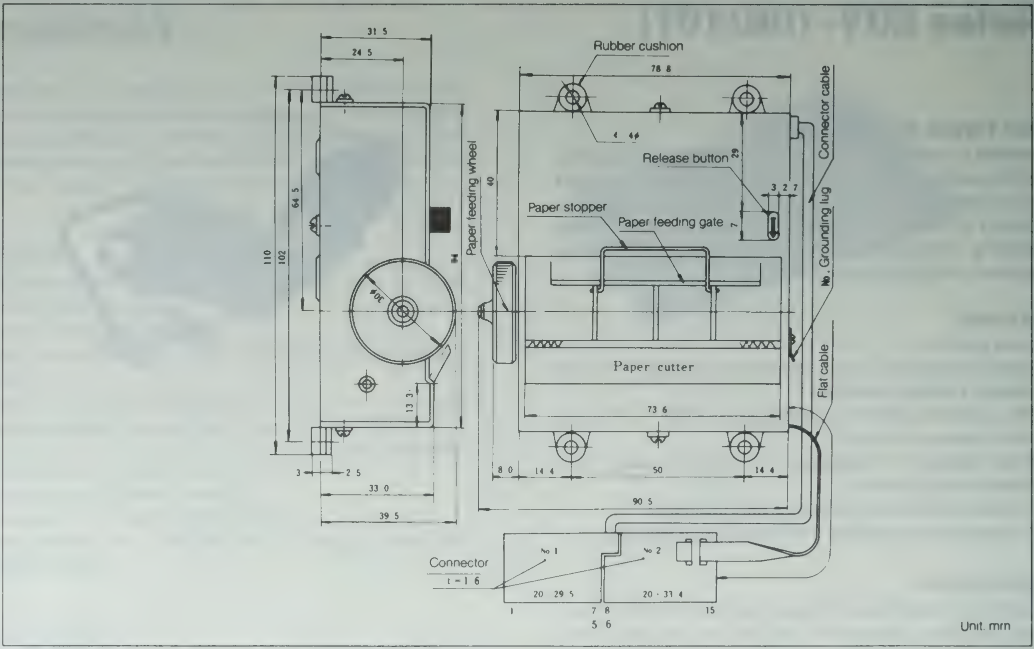
- Computer peripherals, measuring instruments, medical equipment, analyzers, fire and burglar alarms and microcomputer peripherals.

Specifications

Items / Types	Electrosensitive/EUY-10E	Thermal/EUY-10T
Number of Characters per Line	15, 21, 32, 40	15, 21
Kind of Characters	Alphanumerics and symbols	
Character Construction	7×5 dot matrix	
Printing Speed	Approx. 2 lines/second	
Character Size	Height: Approx. 2.7mm	
Voltage	Motor $-24V\pm^{10}_{5}\%$ Head $-24V\pm^{10}_{5}$	Motor $-24V\pm5\%$ Head $-24V\pm5\%$
Current (Average)	Motor 100mA Head 100mA	Motor 100mA Head 1A
Life	1×10^6 lines (MCTF)	
Outside Dimensions	Width : 90.5mm max. Height: 42.5mm max. Depth : 110.0mm max.	
Weight	Approx. 370g	
Recording Paper	Metallized recording paper Width 60mm, Length 30m 1) Silverno 890-2B (Honshu Paper Co., Ltd.) 2) Bosch RMP 8146 No.0674, 007, 001 (Robert Bosch GmbH)	Thermal paper Width 60mm, Length 30m 1) TP50CA (Jujo Paper Co., Ltd.) 2) PH100M (Mitsubishi Paper Mills, Ltd.) 3) 205PB (Ricoh Co., Ltd.)
Operating Temperature	−5℃~50℃	

* A driving interface is also available.
Head driving and motor driving circuits as well as pick-up coil, reed switch input circuits are built-in, and the printer can be operated by external TTL signals.

Dimensions



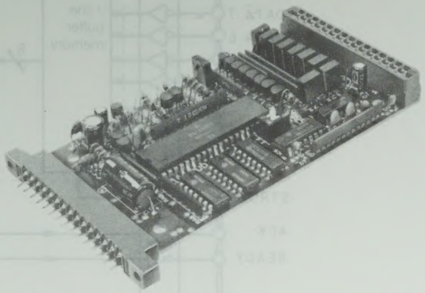
Unit. mm

Arrangement of Connector Terminals

PC board (Connector)	Terminals number	Color code	Electrosensitive EUY-10E	Thermal EUY-10T
No. 1	1	White	Reed switch	Reed switch
	2	Shield cable	Pick up coil	Pick up coil
	3	Shield cable, White	Pick up coil, Reed switch	Pick up coil, Reed switch
	4	Red	Motor (+)	Motor (+)
	5	Black	Motor (−)	Motor (−)
	6	Pink (Only EUY-10E)	Head common (Ground) Roller electrode	Incorporating No. 2 of pc board — Thermistor(+)
	7	——	——	Thermistor(−)
No. 2	8	——	1st dot of the head (−)	1st dot of the head (−)
	9	——	2nd dot of the head (−)	2nd dot of the head (−)
	10	——	3rd dot of the head (−)	3rd dot of the head (−)
	11	——	4th dot of the head (−)	4th dot of the head (−)
	12	——	5th dot of the head (−)	5th dot of the head (−)
	13	——	6th dot of the head (−)	6th dot of the head (−)
	14	——	7th dot of the head (−)	7th dot of the head (−)
	15	——	——	Head common Ground(+)

Series 700 (EUY-PUD700) for EUY-10E/10T

A compact interface unit for driving printers employing a 4-bit, 1-chip microcomputer for the control of EUY-10E and EUY-10T printers. It has built-in functions of shake-hand data transfer control, 1-line buffer memory of an 8-bit parallel data as well as 128 kinds of character generation which is the same as ordinary terminals.



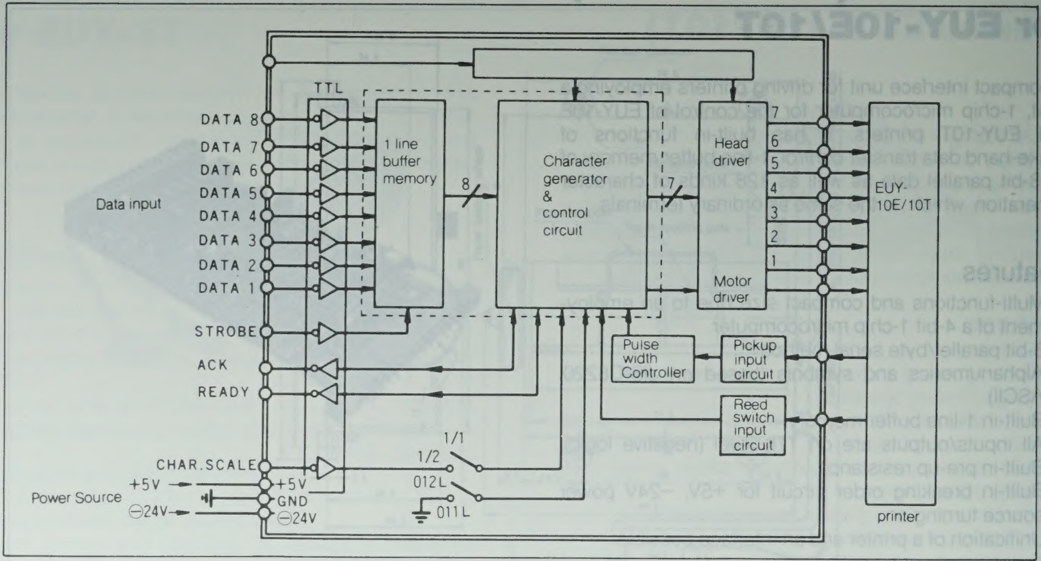
Features

- Multi-functions and compact size due to an employment of a 4-bit 1-chip microcomputer.
- 8-bit parallel/byte serial method
- Alphanumerics and symbols (based on JIS-C6220, ASCII)
- Built-in 1-line buffer memory
- All inputs/outputs are on TTL level (negative logic). Built-in pre-up resistance.
- Built-in breaking order circuit for +5V, −24V power source turning on.
- Unification of a printer and an interface possible.
- Low current consumption.

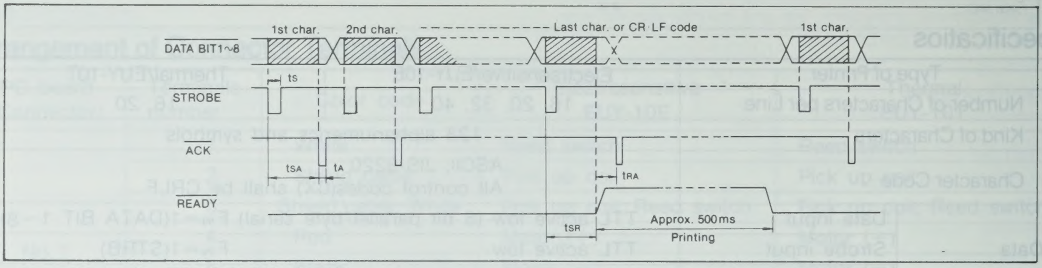
Specificatios

Type of Printer		Electrsensitive/EUY-10E	Thermal/EUY-10T
Number of Characters per Line		16, 20, 32, 40	16, 20
Kind of Characters		128 alphanumerics and symbols	
Character Code		ASCII, JIS-6220 All control codes(0X) shall be CRLF	
Data Transmission Signal	Data input	TTL active low (8 bit parallel/byte serial) $F_{IN}=1$(DATA BIT 1~8)	
	Strobe input	TTL active low $F_{IN}=1$(STRB)	
	Acknowledge output	TTL active low (response to data input) $F_{OUT}=10$(ACK)	
	Ready output	TTL active low $F_{OUT}=10$(RDY)	
	Char.scale(Freq.div.)	TTL low······16,20 high······32, 40 at SW1=ON $F_{IN}=1$	
Manual Switching	Char.scale(Freq.div.)	SW1 ON······16, 20 OFF······32, 40	
	Model selection	SW2 ON······011, 311 OFF······012, 312	
Power Source		+5V±5%(110mA typical)	+5V±5%(110mA typical)
		$-24V\pm^{10}_{5}\%$(300mA max. while printer shall be operating.)	−24V±5%(1A max. while printer shall be operating.)
Operation	Data input	1) Shakehand asynchronous input by STRB and ACK signal. 2) STRB signal input.	
	Print command	1) Printer head shall be driven. either by input of control codes (0X) 2) Detection of full level of 1 line buffer memory.	
Dimensions		Width : 67mm Depth : 130mm Height : 20mm	
Weight		Approx.100g	
Operating Temperature		0~50℃	

Blockdiagram



Timing Chart (ex., 16 characters per line)



At the time of detecting READY LOW signal from the printer system, the data source system feeds an 8 bit character code on data bus and transfers STROBE LOW signal to the printer. The printer circuit, receiving the STROBE LOW signal, acquires data in a built in buffer memory and transfers ACK signal at the completion of memory.
As STROBE signal for the last character (16 the character in case of the above timing chart example) drives printer head to scan and ACK signal is output after RDY HIGH level signal is transferred, data feeding from the data source is retained till completion of one line printing.
This off-line operation of the printer for the period of printing will be convenient for versatile system design.

Pin No.		Pin No.	
1	GND	A	(GND)
2	DATA BIT 1	B	DATA BIT 5
3	DATA BIT 2	C	DATA BIT 6
4	DATA BIT 3	D.	DATA BIT 7
5	DATA BIT 4	E	DATA BIT 8(MSB)
6	READY	F	STROBE
7	ACK	H	CHAR·SCALE
8		J	
9	⊖24V	K	
10		L	
11		M	
12		N	
13		P	
14		R	
15	+5V	S	(+5B)

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